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Food Security Policies of Six Asian Countries

Gary Ender

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ABSTRACT

Per capita cereal consumption in Bangladesh, India, Indonesia, Republic of Korea, the Philippines, and Taiwan generally varied less from trend than did per capita production from the late sixties to 1980. This tendency, especially true in the poorer countries, reflects the effectiveness of food security policies implemented throughout the period. However, the stability of per capita consumption varied considerably among the countries. Production technology and in most cases producers' incentives improved, and new or enlarged government stocks have resulted. At the end of the seventies, however, only India was self-sufficient in cereals, and only half the countries studied had increased their rice self-sufficiency. The six countries together imported \$1.051 billion worth of U.S. wheat and wheat flour in 1981 and \$1.077 billion worth in 1982.

Key words: Bangladesh, India, Indonesia, Republic of Korea, Philippines, Taiwan, food security, food policy, food consumption, food production, food imports, stocks, self-sufficiency

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FOREWORD

The International Economics Division of the Economic Research Service is concerned with the broad range of economic and institutional factors that affect U.S. agricultural trade. Internal government policies of other countries have important impacts on trade patterns and flows of food and agricultural commodities. In recent years, many developing countries have adopted policies aimed at achieving food security, that is, maintaining adequate and stable food consumption. It is clear that these policies affect not just domestic food consumption but food production and trade as well.

This study by Gary Ender describes and analyzes the food security policies of six Asian countries--Bangladesh, India, Indonesia, South Korea, the Philippines, and Taiwan. As a group, they account for more than a quarter of world population and figure prominently in world food production and trade. Their experience with various institutional arrangements is critical to an understanding of food security objectives and policy instruments. The data and research results in this report are important to those concerned with analyzing and promoting U.S. agricultural trade and to those involved in analyzing and implementing food aid programs.

Gene A. Mathia
Deputy Director for Regional Analysis
International Economics Division
Economic Research Service

SUMMARY.....	iii
INTRODUCTION.....	1
FOOD SECURITY: OBJECTIVES, INSTRUMENTS, AND TRADEOFFS...	3
Objectives.....	4
Instruments.....	5
Tradeoffs.....	6
METHODOLOGY.....	7
Periods of Analysis and Data Used.....	7
The Food Balance Method.....	9
Undernutrition and the Use of Aggregate Date.....	9
BANGLADESH.....	10
Policy Actions and Emphases.....	10
Results.....	12
Policy Tradeoffs and Trends.....	13
INDIA.....	14
Policy Actions and Emphases.....	14
Results.....	18
Policy Tradeoffs and Trends.....	18
INDONESIA.....	20
Policy Actions and Emphases.....	21
Results.....	22
Policy Tradeoffs and Trends.....	24
REPUBLIC OF KOREA.....	25
Policy Actions and Emphases.....	26
Results.....	26
Policy Tradeoffs and Trends.....	28
PHILIPPINES.....	29
Policy Actions and Emphases.....	30
Results.....	31
Policy Tradeoffs and Trends.....	31
TAIWAN.....	33
Policy Actions and Emphases.....	34
Results.....	34
Policy Tradeoffs and Trends.....	35
COMMON THEMES IN ASIAN FOOD SECURITY POLICIES.....	37
REFERENCES.....	40
APPENDIX TABLES.....	43

SUMMARY

Per capita cereal consumption in Bangladesh, India, Indonesia, Republic of Korea, the Philippines, and Taiwan varied less from trend than did per capita production from the late sixties to 1980. This tendency, especially true in the poorer countries, reflects the effectiveness of national food security policies implemented throughout the period. The stability of per capita consumption, however, varied considerably among the countries. The six countries together imported \$1.051 billion worth of U.S. wheat and wheat flour in 1981 and \$1.077 billion worth in 1982.

Rice is the most important cereal consumed, and its availability has been more stable than that of each of the other cereals (with the exception of wheat in India) in each country. Rice consumption was generally more stable than rice production, while the reverse was true for secondary cereals.

Because of a strong desire for self-sufficiency, and in some cases for rural-urban income parity, all these countries attempted to improve producer incentives. Output price supports and input subsidies were common. The combination of these efforts and better production technology and infrastructure resulted in rising yields, which caused per capita production to rise or at least keep from falling. Only half the countries progressed toward rice self-sufficiency, however, and only India was self-sufficient in cereals at the end of the seventies. Another result of policy and production changes was larger stocks.

Specific findings are that:

- o Bangladesh found it necessary to maintain a food rationing system, although the Government is attempting to shift the emphasis of its policies away from the import-fed ration system and toward greater self-sufficiency.
- o India's food security policies stabilized per capita consumption and increased production. Food production remains variable, but current policies should help stabilize imports.
- o Indonesia was the only country with an increasing trend in per capita rice consumption, and this consumption was also the most stable around trend. Indonesia made dramatic progress in rice production and Government marketing programs, and currently holds very large stocks.
- o Korea, with probably the most interventionist food policies, had the highest and the most unstable per capita cereal consumption. Rice yields and production have reached very high levels, but Korea has not achieved lasting rice self-sufficiency.
- o The Philippines, with the least interventionist policies, did not operate a food distribution system. Its increased emphasis on production has enhanced self-sufficiency.

- o Taiwan's high rice prices continue to ensure self-sufficiency and promote farm/nonfarm income parity, but in combination with falling per capita rice consumption they have also resulted in today's burdensome stocks.

Food Security Policies of Six Asian Countries

Gary Ender

INTRODUCTION

For a country, achieving food security means reaching its food consumption target. Food insecurity may result from a persistent imbalance between target and actual food consumption or from fluctuations in food supplies or real income. Food security policies are food and agricultural policies which are intended to promote adequate and stable food consumption.

The food security policies of the developing countries are important to the United States, as well as to the other developed countries, because those policies have significant impacts on the production, consumption, and trade of food. In many developing Asian countries, only the government imports food, so these countries' food security policies have a direct impact on U.S. exports. Because these policies affect production and consumption, they also have an indirect impact on trade. The demand for concessional food imports, moreover, is an indirect but no less real demand for U.S. farm products.

This study analyzes food security policies in Bangladesh, India, Indonesia, Korea, the Philippines, and Taiwan. All these countries are important outlets for U.S. exports of food grains (table 1). With the exception of Bangladesh, these countries are important commercial markets for wheat; Korea has also been an important market for rice. All have been recipients of wheat and/or rice under P.L. 480 (table 2). Except for shipments to the Philippines, these amounts were all substantial. The six countries span the range of per capita income in developing Asia, and their total population of more than 1 billion makes their policies extremely important to world agricultural production and trade.

These analyses of food security policies will lead to a better understanding of the demand for U.S. exports, and a better balance between the supply and demand for U.S. farm products. An analysis of the ways P.L. 480 is used in conjunction with other programs, moreover, will lead to an improved understanding of the transition from a concessional to a commercial market.

Table 1--U.S. P.L. 480 exports of wheat and rice to Bangladesh, India, Indonesia, Korea, Philippines, and Taiwan, fiscal 1955-73

Item	Quantity	Value
	<u>1,000 metric tons</u>	<u>Million dollars</u>
Wheat and wheat flour:		
Bangladesh <u>1/</u>	3,611	517
India	53,718	3,303
Indonesia	1,981	128
Korea	10,481	658
Philippines	170	11
Taiwan	3,140	204
Rice:		
Bangladesh <u>1/</u>	720	229
India	2,003	260
Indonesia	2,848	444
Korea	1,955	312

1/ Fiscal years 1974-82.

Sources: U.S. Agricultural Exports under P.L. 480, ERS Foreign 395, USDA, October 1974. USDA, Foreign Agricultural Service, Office of the General Sales Manager.

Food security policies are extremely important to a developing country because they affect:

- . nutritional adequacy,
- . farm income,
- . food prices and political stability,
- . agricultural productivity and the potential for industrialization, and
- . the government's budget and foreign exchange reserves.

Food security in Asia is not only a complex set of issues and policies, it also hinges on rapidly changing and potentially surprising events. In 1980/81 for example, the Republic of Korea imported 2.2 million metric tons of rice, after having "achieved" rice self-sufficiency in 1977/78. The drought-stricken 1979/80 wheat crop in India was more than 10 percent lower than the 1978/79 crop, and the rice crop was lower by even more. After 3 years of no imports, in 1981/82 India imported 2.3 million tons of wheat (and at least 2.5 million tons in 1982/83), but it also recently exported rice. Because individual situations can change so quickly, it is important to understand the responses that policymakers have made and are likely to make to domestic and international events.

Table 2--U.S. exports of wheat and rice to Bangladesh, India, Indonesia, Korea, Philippines, and Taiwan

Item	Quantity		Value	
	1981 1/	1982	1981	1982
	<u>Metric tons</u>		<u>1,000 dollars</u>	
Wheat and				
wheat flour:				
Bangladesh	264,530	751,181	38,949	102,642
India	1,403,363	1,564,215	241,958	254,458
Indonesia	724,247	968,376	129,626	155,660
Korea	2,032,324	1,873,617	357,770	298,760
Philippines	856,852	1,050,906	162,369	157,429
Taiwan	629,795	637,953	120,735	108,951
Rice:				
Bangladesh	-	54,555	-	15,400
Indonesia	91,414	14,190	45,884	3,940
Korea	968,115	253,476	418,929	65,289

- = None or less than 0.5 metric ton.

1/ Calendar years. Exports are commercial except for wheat and rice to Bangladesh, small amounts of wheat to India, Indonesia, Philippines, and Korea, and some rice to Indonesia.

FOOD SECURITY: OBJECTIVES, INSTRUMENTS, AND TRADEOFFS

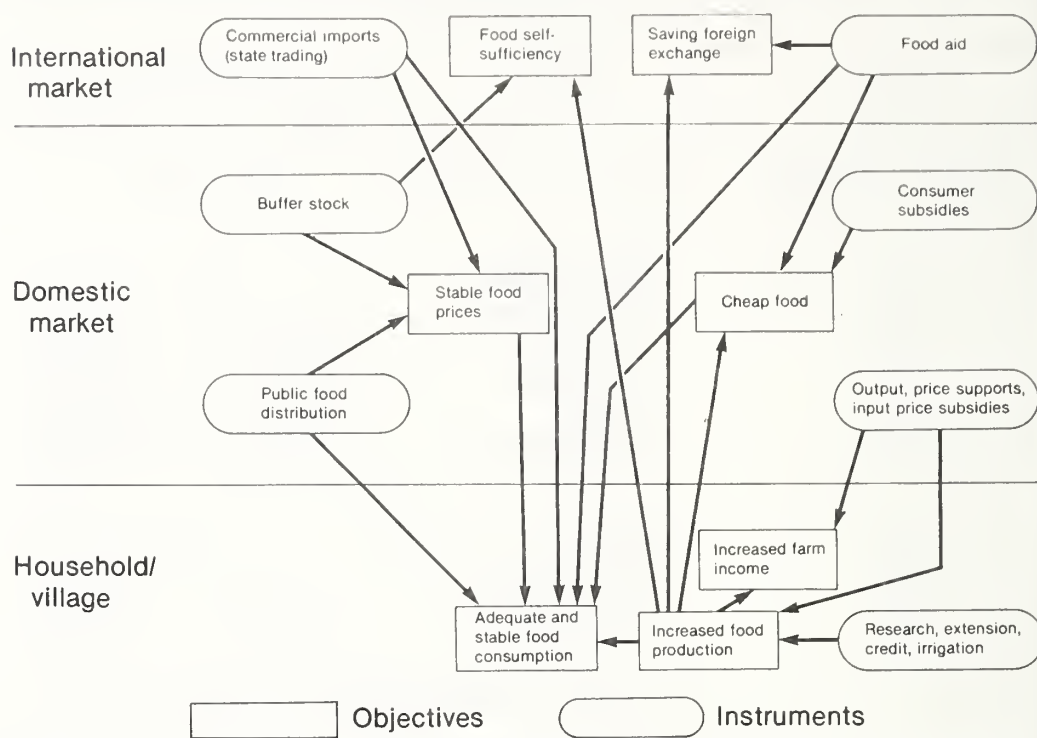
To achieve food security, a country must have a high probability of meeting its food consumption target. For individuals, however, food security can only be defined as nutritional adequacy for everyone; that is, the distribution of food consumption is an important element of food security. Nevertheless, much can be learned from national (aggregate) data. Thus in this study, average consumption is used as an indicator of basic trends in consumption. This study also examines the stability of food consumption by calculating the variability of per capita consumption of each cereal and total cereals.

One problem for the food security analyst is that food consumption targets are rarely stated. Bangladesh is a notable exception. This study is thus conducted on the assumption that all policymakers aim to achieve low variability of food consumption, while maintaining or achieving an adequate (but unstated) level of consumption. Implicit in this assumption is also an acceptable level of food prices and food price variability.

Food security policies can be analyzed by examining the objectives of policymakers, the instruments available to them (fig. 1), and the tradeoffs they must make.

Figure 1

Food Security Policy Objectives and Instruments



Objectives

The objectives of food security policies may be ends in themselves or intermediate objectives which further other objectives. Adequate and stable food consumption is the ultimate objective, whereas increased food production is a means to self-sufficiency and cheaper food. Some objectives, like saving foreign exchange, can also be thought of as constraints. The most important food security objectives in Asia are the following.

Adequate and Stable Food Consumption

This is the primary objective of food security policies. Adequate consumption means there is no excess of nutritional requirements over actual consumption, and stable consumption means that fluctuations in consumption have been reduced to an acceptably low level.

Self-Sufficiency

A widely proclaimed objective, self-sufficiency (in food or a particular staple) is the ability to supply one's own consumption requirements. Two common measurement criteria are production at least equal to consumption and the absence of imports. Neither of these measures accounts for changes in stocks, however. When a developing country proclaims it is

self-sufficient, it very often means it did not have to import in a given year. It seems reasonable that a country which has "achieved" self-sufficiency should meet some criterion many years consecutively or on the average over several years. Self-sufficiency is sought to reduce reliance on uncertain international markets, to save foreign exchange, to maintain national security, and to enhance national pride. Self-reliance is a related but broader concept encompassing the means to pay for imported food with export earnings.

Saving Foreign
Exchange

Food security policies must mesh with other development and general policies, many of which require hard currency for their implementation. Thus food security policy may include the objective of conserving foreign exchange. Food imports can be decreased if production increases fast enough, and the cost of imported food can be reduced if food aid replaces commercial imports.

Stable Food Prices

Food prices are stable if they exhibit low variability around their trend. Stable food prices promote stable consumption, which is particularly important to poor consumers. They are also a disincentive to private storage operators, however.

Cheap Food

Cheap food generally leads to more adequate food consumption, especially by the poor. Cheap food may also be important to keeping manufactured exports competitive, since workers in developing countries usually spend a significant proportion of their wages on food. Low retail prices are often demanded by a vocal urban population.

Increased Food
Production

Accelerating the growth of food production is a goal of almost every developing country. It is an intermediate objective which furthers several other objectives--self-sufficiency, saving foreign exchange, and cheap food--and may also go hand-in-hand with increased farm income.

Increased Farm
Income

Several developing countries have consciously sought to equalize farm and nonfarm incomes. Thus, they have specifically included increased farm income in their food security objectives. Higher farm income is generally promoted by the same instruments used to promote higher production.

Instruments

Food security policymakers use a variety of instruments to further their objectives, and a given instrument often affects more than one objective. The most important instruments are the following.

Commercial Imports

Imports are the most traditional way of filling domestic food gaps. They contribute directly to stabilizing food consumption and prices. Many Asian countries have banned private imports of food grains, leaving the state as the sole importer. Imports may also be constrained by a shortage of foreign exchange.

Food Aid

Food aid is often an important source of cheap food which can be used to stabilize consumption. If food aid is only an

addition to the food supply, it will depress prices and production. If the method of distribution is such that demand is also increased, however, these negative impacts on producers may be negligible. Food aid can also replace or supplement commercial imports, thus affecting foreign exchange. Finally, the stability of food aid is important to countries receiving it regularly. Thus food aid may contribute to food security by increasing the stability of the food supply.

Output Price
Supports and Input
Price Subsidies

Many Asian governments believe that free market prices have not been sufficiently stable or remunerative to their farmers. Thus, these governments intervene in the market and support prices (or subsidize input use) to both increase production and raise farm incomes. Because price support programs involve the purchase ("procurement"), movement, and storage of grain by the government, they typically require some years of experience before they become effective. Inputs subsidized include fertilizer, credit, and irrigation.

Research, Extension,
Irrigation

The major alternative to price supports (or input subsidies) as a means of spurring production is investment in production infrastructure. Research on high-yielding varieties, an extension service, and irrigation facilities are the primary areas for investment. These are highly complementary activities; if the budget allows, price supports can also be complementary to these investments.

Buffer Stock

Buffer stocks can be built through domestic procurement or imports. The government usually sets a target level which it feels is appropriate to stabilize prices. To arrive at this level, the variability of production and the costs of holding stocks must be analyzed.

Public Food
Distribution

Food distribution programs use procured or imported grain and may further any of several objectives. Usually these programs attempt to ensure adequate and stable consumption by a target group, but they may cover an entire population. They may also be used to stabilize prices by varying the amounts released, and to subsidize consumers. Consumption of a cheaper or more available grain may also be encouraged. Public distribution programs may take the form of salary payments in kind, ration schemes, or fair-price shops.

Consumer Subsidies

Effective consumer subsidies result in cheaper food for their recipients. Lower cost food may be desirable for its nutritional impacts or for its role as a wage good (see "Cheap Food," p. 5). Consumer subsidies can be effected through public distribution programs or legislated price ceilings.

Tradeoffs

Any of the instruments available to policymakers may have more than one effect. For example, increased food production through a shortrun program of price supports to induce adoption of new technology may increase producer income but subject consumers to higher prices in the short run; in the long run, however, the greater supply may lead to lower prices. With many instruments available and each instrument having more than one effect,

the essence of food security policymaking is found in the tradeoffs which result from the use of various policy instruments over time. Such combinations of instruments can be termed strategies.

The conditions from which policymaking takes its cues, moreover, are usually changing. Populations grow and migrate; the level, variability, and pattern of production change; new technologies are perfected; and trade becomes more or less open. Thus the policymaker must continually restrike the balances among competing interests and conflicting objectives.

One can examine two key aspects of food security policymaking: the tradeoffs among the effects of different strategies and the choice of those strategies.^{1/} Food security policymaking involves tradeoffs between effects on consumers, producers, and taxpayers, and between shortrun and longrun results. The effects of a price support program have been seen. Consider further a dilemma faced by many governments: what to do when production falls and prices begin to rise in the cities. By procuring at this time, government adds to the competition for scarce grain and may aggravate the effect of high prices on rural consumers, although distribution programs may assist urban consumers. To achieve their objectives, policymakers must choose among alternative strategies. Thus, a country can seek self-sufficiency or rely on trade, and it can limit its interventions to one commodity or attempt to influence the production and/or consumption of several commodities. Similarly, with scarce public resources, price supports and infrastructural investment are strategic alternatives, although it may often be desirable to use them as complements.

METHODOLOGY

Many food security-related goals have been announced over the past 10 to 15 years. The priorities among these objectives and the tradeoffs made in choosing a strategy to achieve them must be inferred, however, and this is a major objective of this study. Although food security policies are interrelated with the goals and effects of other policies, the scope of this study is limited to food security-related goals and effects. Because food security is a major goal of the countries studied, the analyses reasonably assume that each government aims to achieve tolerably low variability of food consumption, while maintaining or achieving an adequate level of consumption. Cereal consumption is used as a proxy for food consumption because of the significant trade in cereals and the high proportion of total caloric intake that comes from cereals (table 3).

Periods of Analysis and Data Used

An appropriate time period for these analyses would begin with the Green Revolution and end in the present, covering from about 1965 to 1981. A period of this length would reasonably permit a discussion of the variability of consumption, and allow

^{1/} For a review of the food security literature and discussions of tradeoffs and choices of strategies, see (9). Under-scored numbers in parentheses refer to items in the references.

Table 3--Cereals' share of daily caloric intake, six countries

Item	Unit	1964-66	1972-74	1975-77
Bangladesh:				
Total intake	Calories/person	—	1,949	1,865
Share from cereals	Percent	--	84	85
India:				
Total intake	Calories/person	1,964	1,967	1,889
Share from cereals	Percent	64	66	65
Indonesia:				
Total intake	Calories/person	1,760	2,031	2,115
Share from cereals	Percent	60	67	66
Republic of Korea:				
Total intake	Calories/person	2,329	2,749	2,683
Share from cereals	Percent	80	75	73
Philippines:				
Total intake	Calories/person	1,911	1,957	2,128
Share from cereals	Percent	63	65	62
Taiwan:				
Total intake	Calories/person	2,402	2,757	2,766
Share from cereals	Percent	64	59	56

-- = Not applicable.

Sources: FAO, Food Balance Sheets, 1964-66, 1972-74, 1975-77; Taiwan Food Balance Sheets, 1935-80, July 1981, Council for Agricultural Planning and Development.

one to examine the full effects of the new technologies on food security. Because of the limited availability of reliable data and for historical reasons (like the formation of Bangladesh), however, the periods of analysis end in 1979 or 1979/80 and vary as follows: Bangladesh, 8 years; Indonesia, 10 years; India, Philippines, and Taiwan, 12 years; and Korea, 13 years.

Most of the data to support these analyses are contained in app. tables 1-41. Although virtually all the data used are reliable, two of the rice production series are somewhat questionable. Several knowledgeable observers have concluded that rice production in the Philippines is probably underestimated, although

it is not clear by how much. In addition, rice production in Korea may have been overestimated in certain recent years.

The Food Balance Method

In determining the variability of food consumption, one is immediately confronted by the absence of annual nationwide food consumption surveys, which do not exist even for the United States and most other countries. It is possible, however, to construct a series of food balances which are reasonably reliable, cover a number of consecutive years, and include all consumption. A food balance is a complete accounting of the elements of food supply (production, trade, change in stocks) and utilization (food, feed, seed, waste, industrial use).

Two primary weaknesses of food balances must be recognized, however. First, because consumption, or availability, is estimated as a residual, any errors in the data series used will compound into the error in consumption. In this study, this problem is mitigated by the relatively small number of elements in the food balances: food grains are generally not used for feed or industrial purposes in these countries. The data series are also carefully selected for consistency of source. If data on a particular variable were not available from the same source over the entire period of analysis, the period was generally shortened. These shortened periods, however, do not significantly limit the applicability of the conclusions drawn about the post-Green Revolution period. The exception to this data rule is government stocks, where in some early years when stocks were low, no change was assumed for one or two previous years. Reliable commercial stock data are usually not available, so the food balance calculations implicitly assume no change in these from year to year.

The second major weakness in the food balance method is that data on postharvest losses are necessarily poor. This problem is handled by initially calculating availability plus losses, that is, not subtracting any estimate of losses. Subsequently, FAO constant percentage loss assumptions, which are the best available, are used to derive estimates of losses, which are netted out of availability. Because loss rates vary over the different cereals and the mix of cereals consumed varies over the years, it is possible that the introduction of losses into the calculations may alter the variability of apparent food consumption. (By contrast, a constant percentage loss assumption will not lead to any change in the coefficient of variation of consumption of a particular cereal.) In this way, the variability of cereal consumption changed slightly in two of the six countries. Because it is not this study's objective to determine the best estimate of actual consumption of a particular cereal in a particular year, it is not a significant problem that assumptions regarding losses are always quite tenuous. The estimates of consumption, moreover, do correspond well with those of other studies.

Undernutrition and the Use of Aggregate Data

An analysis based only on aggregate consumption data cannot assess the nutritional status of individuals. Because nutritional adequacy for all individuals is the ultimate objective

of food security policies, the implications of food policies for the poor are discussed where possible. National aggregates, moreover, provide one important set of indicators of the results of food policies, at the level at which policy is initially made.

It should also be emphasized that in this study, assessments of self-sufficiency, whether they relate production or imports to consumption, are based on market demand, not nutritional need. Thus countries described as self-sufficient may have many undernourished citizens.

BANGLADESH

This analysis of food security policies in Bangladesh covers rice and wheat from 1972/73, just after the inception of the republic, through 1979/80.^{2/} Because a rather different political economy has existed since the war of independence, the analysis does not extend back into the East Pakistan period. East Pakistan, however, received an average of about 150,000 tons of rice per year from West Pakistan during the sixties, including over 400,000 tons in 1969/70. Only very recently was this trade resumed.

Following the war, rice production in 1972/73 continued to be more than 10 percent below the 1967/68-1970/71 average, and wheat production was still insignificant. To maintain food-grain consumption at a tolerable level, almost half a million tons of rice were imported in 1972, and nearly 2.5 million tons of wheat were imported in 1972/73. All these imports should be considered concessional, since what was not imported under concessional arrangements was purchased with donated cash. These imports caused per capita wheat consumption in 1972/73 to be more than 35 percent higher than in any of the following 7 years (app. table 36). This was critically important because per capita rice consumption in 1972/73 was the lowest it would be during this same period (app. table 35).

Policy Actions and Emphases

The keystone of food security policy in Bangladesh has been the ration system, which is almost as old as the republic. There are many categories of rationing in Bangladesh. These can be classified by objective as 1) distribution to salaried workers (providing subsidized food to government and other employees), 2) price stabilizing (augmenting open market supply and supplying flour mills), and 3) food relief (providing free food to the very poor and food-for-work) (table 4). The first category has been used to stabilize consumption and, indirectly, prices. It has usually dominated the ration system, with the second category also a significant portion. (Distributions under modified rationing in 1972 and 1973 should probably be considered food relief, so that category dominated in the 2 post-war years.) Food relief gained in share (via food-for-work) during the late seventies, while price stabilizing rationing

^{2/} Split years referring to Bangladesh are July/June unless otherwise noted.

Table 4—Bangladesh: Ration offtakes by category 1/

Ration category	1972	1973	1974	1975	1976	1977	1978	1979
	<u>1,000 metric tons</u>							
Total offtake	2,538	2,074	1,737	1,789	1,306	1,816	1,644	2,359
	<u>Percent</u>							
Distribution to salaried workers <u>2/</u>	25	41	54	52	47	54	58	48
Price stabilizing <u>2/</u>	57	55	39	43	35	34	28	33
Food relief <u>2/</u>	18	4	7	5	18	12	14	19
Total	100	100	100	100	100	100	100	100

1/ Offtake is the term used in South Asia for the quantity distributed by a ration system.

2/ Distribution to salaried workers includes the following types of rationing as they are designated by Bangladesh: statutory, essential and other priorities, and large employers; price stabilizing includes modified, flour mills, marketing operations, and open market sales; food relief includes gratuitous relief and food-for-work.

Source: Government of Bangladesh, Ministry of Food and Civil Supplies.

decreased somewhat (via modified rationing). The ration system has generally served urban areas more than rural areas, and has not been targeted on the poor.

The Government of Bangladesh has consistently attempted to use both output price supports and input subsidies to encourage higher production of foodgrains. Total fertilizer distribution grew at 15 percent per year between 1972/73 and 1979/80, but because it started from a very small base, usage per hectare (ha) remained very low.^{3/} Rice production thus grew slowly, and per capita rice production showed no upward trend (app. tables 5 and 6).^{4/} Despite the Government's efforts, output price incentive schemes were ineffective for either fiscal or

^{3/} According to the Bangladesh Agricultural Development Council, total distribution during 1972/73 through 1979/80 was (in thousands of long tons of fertilizer) 384, 380, 280, 458, 516, 715, 742, 842.

^{4/} Wheat production increased dramatically in the late seventies but was still only 4 percent of rice production in 1979/80.

administrative reasons until the late seventies; procurement prices were often announced at harvest (particularly for the main rice crop) rather than before planting. Another major deficiency in the production system was water control, an issue which Bangladesh is now giving priority. To relieve some of the burden of providing agricultural production support services, the Government began shifting fertilizer supply functions to private dealers in 1978; by 1980, three-quarters of the fertilizer distributed was handled by the private sector.

Although food self-sufficiency has been one of its objectives, Bangladesh has relied heavily on imported foodgrains, over which the Government has sole control. Typically, between 10 and 20 percent of consumption has been imported, much of it on concessional terms (app. tables 15 and 19). Nearly all wheat has been imported. Ahmed points out that, because of the existing price relationships, the Government could both make a profit and subsidize consumers in distributing concessional imports, whereas with procured grain a consumer subsidy would come directly from the treasury (1, pp. 11, 26). Nevertheless, between 1972/73 and 1975/76, the foodgrain subsidy ranged between 7 and 13 percent of the total Government budget (1, p. 27).

Results

The combination of policy actions and other factors in the food system of Bangladesh resulted in per capita cereal consumption varying between 143.5 kilograms (kg)/person/year (13.9 ounces (oz)/person/day) and 160.7 kg/person/year (15.5 oz/person/day), the latter figure being the Government's target (29, p. 58).^{5/} There was no upward or downward trend. The average annual variability of per capita foodgrain consumption was 3.4 percent, considerably less than the 5.9-percent variability in per capita foodgrain production.^{6/} Similarly, the variability in per capita rice consumption was 4.8 percent and that in per capita rice production, 6.3 percent (app. table 41). Wheat was clearly used to fill the foodgrain gap: its annual variability in consumption was 34.5 percent, and the correlation between wheat and rice consumption was -0.62.

Foodgrain production was never sufficient to avoid imports. Cereal self-sufficiency ranged between 78 percent in 1972/73 and 94 percent in 1975/76, and averaged 87 percent (app. table 11).^{7/} The required imports, moreover, were largely purchased on concessional terms. Some 62 percent of the rice fell in this category and 72 percent of the wheat, for an overall average of 70 percent. Wheat was consistently purchased this way;

^{5/} Consumption figures are on a milled basis for all grains (app. table 34).

^{6/} The variability is calculated as the standard error of a linear trend regression over the mean.

^{7/} Cereal self-sufficiency is net production as a percentage of consumption; net production is total production less seed and feed use; losses are not subtracted from either production or consumption.

the commercial and concessional shares of rice imports fluctuated considerably, and the amounts were much smaller.

Policy Tradeoffs and Trends

Political and economic stability have been extremely important societal goals in Bangladesh. Both were served by the ration system, which has favored the military and civil servants, ensuring their contentment to some extent. The system provided them and others with subsidized food, thereby attempting to stabilize food consumption, an important component of economic welfare. In the aggregate, foodgrain consumption in Bangladesh has been quite stable.

Because it focused on stability, did Bangladesh sacrifice potential increases in the levels of production and consumption? Administrative and fiscal resources devoted to distributing subsidized food might have been used to vigorously defend price supports earlier, for example.^{8/} Such a strategy would be based on the longrun goal of increasing domestic production as a way of ensuring adequate consumption. On the other hand, it may not have been possible to accelerate the development of a capable extension service which had useful research results. If technical factors were limiting, then stronger output price incentives would have been expensive and unproductive. Even in the absence of strong price supports, the fertilizer subsidy burden borne by the Government was substantial. Thus stronger price supports would probably have been an unwise gamble. Rather the Government chose to put cheap, imported food into the ration pipeline. It thereby achieved to some extent its shortrun goal of stabilizing food consumption. At the same time it successfully encouraged increased fertilizer use. Rice yields have increased modestly as a result, but they may increase more rapidly as water control improves.^{9/}

Public stocks of foodgrains in Bangladesh have been used as intertemporal pipelines to the ration system. The imports which have fed the ration system (mostly wheat) could be scheduled to arrive at desired intervals. Thus the cost of this storage program has probably been considerably less than for a buffer stock used to stabilize prices through open-market sales. The Government currently operates its storage program for both purposes.

Food security policies in Bangladesh began to shift, starting approximately in 1979/80. Guided by the advice of its aid donors, Bangladesh revised its programs, basing them on a new strategy. The Government now aims to rely more on domestic production, and less on imports and the ration system. To achieve these goals, the Government has invigorated the procurement program so that it can better defend floor prices, and plans to make major gains in water control.^{10/} The per capita

^{8/} But salary demands in the absence of subsidized food might have resulted in similar expenditures by the treasury.

^{9/} 1.1 percent per year between 1972/73 and 1979/80.

^{10/} Irrigated area is targeted to increase from 3.6 to 7.2 million acres during the 1980-85 period. See The Second Five Year Plan (4), p. XII-3 and accompanying text.

ration entitlement has been reduced three times since early 1980, and cheaper wheat has been substituted for the preferred rice. In addition, P.L. 480 wheat imports are now tied to the use of enlarged stocks to stabilize foodgrain prices. Construction of the necessary warehouses is underway. If Bangladesh is indeed attempting to reduce the role of the ration system, the most important question one can ask about its future food security is whether it can be done without sacrificing political and economic stability. If it can, there is reason to believe that at least food self-sufficiency can increase substantially in Bangladesh.

INDIA

This analysis of Indian food security policies covers rice, wheat, corn, barley, sorghum, and millet from 1967/68 through 1978/79, or roughly from the onset of the Green Revolution to the end of the 1970's.^{11/} At the beginning of this period, a recovery was underway in foodgrain production. The fall 1967 rice crop and the spring 1968 wheat crop each followed two crops seriously reduced by droughts. In 1968, wheat production entered a period of rapid growth, based on continuing increases in area and new increases in yield. This was possible because agricultural production support services had been developed over a number of years. Concessional imports of wheat had peaked at almost 8 million tons in 1965/66 (August-July), but were still almost 6 million tons in 1967/68.

The Food Corporation of India was organized in 1965 to stabilize prices and supplies of grain. In 1966 the National Food Grains Policy Committee recommended the replenishment of a 4-million-ton buffer stock, which had been depleted in the drought years. Government control of foodgrain imports and fair-price shops for public distribution were established practices by 1967 (33).

Policy Actions and Emphases

The Indian Government has taken many types of action to further its food security policy objectives. While the objectives and direction of policy have been quite consistent, the steps taken have varied considerably from year to year. Perhaps the most dramatic example of policy fluctuation is the unsuccessful attempt at socialization of the domestic grain trade in 1973. The Government has generally felt it necessary to exert control or influence over the foodgrain sector at many points, including input and output prices; imports; and procurement, storage, and distribution. It has been said, however, that the "interest in food policy...varies inversely with the ease in food availability" (34, p. A-2).

On the production side, the Government has maintained varying levels of fertilizer subsidies as well as procurement prices

^{11/} Split years regarding India mean November-October for rice, corn, sorghum, and millet, and April-March for wheat and barley. In aggregating, maximum overlap dictates that November-October 1967/68 be added with April-March 1968/69 (this is referred to as 1967/68), and so on.

which often functioned as support prices. Research, extension, and irrigation were also emphasized. Procurement prices have generally been announced at harvest. In conjunction with procurement, the movement of foodgrains across state boundaries (that is, from surplus to deficit areas) has been restricted in some way every year, although formal zoning ended in 1977. Nearly all the grain procured has been rice and wheat.

Procurement has served both as a partial price support mechanism and as the beginning of the Government's marketing operation. Foodgrains are then distributed to consumers through fair-price shops, which are mostly in cities, and to flour millers, who in turn sell to bakers under a quota system. Fair-price shop supplies are rationed informally; certain disincentives, like location in low-income neighborhoods and long queues, limit participation by the less needy. There have also been efforts to limit price increases in the regular retail market by supplying more grain through the fair-price shops and the millers. In addition considerable wheat has been distributed in the traditionally rice-eating areas, where at times a purchase of wheat was required in order to obtain rice (30, p. 15; 26, p. 41). The acceptance of wheat in these areas has given the Government somewhat greater flexibility in dealing with food shortages.

Self-sufficiency has been a very important objective of Indian policymakers. Wall notes that it would be more hazardous for a very large country like India to rely on the world market for a given fraction of consumption than it would be for a smaller country (35, p. 71). Consonant with the pursuit of self-sufficiency, India has maintained substantial stocks of foodgrains. Whether these have served as buffer stocks or simply operational supplies which sometimes grew large is difficult to determine. Wall writes that India had not actively pursued a buffer stock policy, in the sense that stocks were not built up when production was above trend (35, pp. 69-70).^{12/} On the other hand, when stocks have been depleted, there has been a desire to replenish them, and the large wheat imports of 1975-77 may have been intended to enlarge the buffer stock.

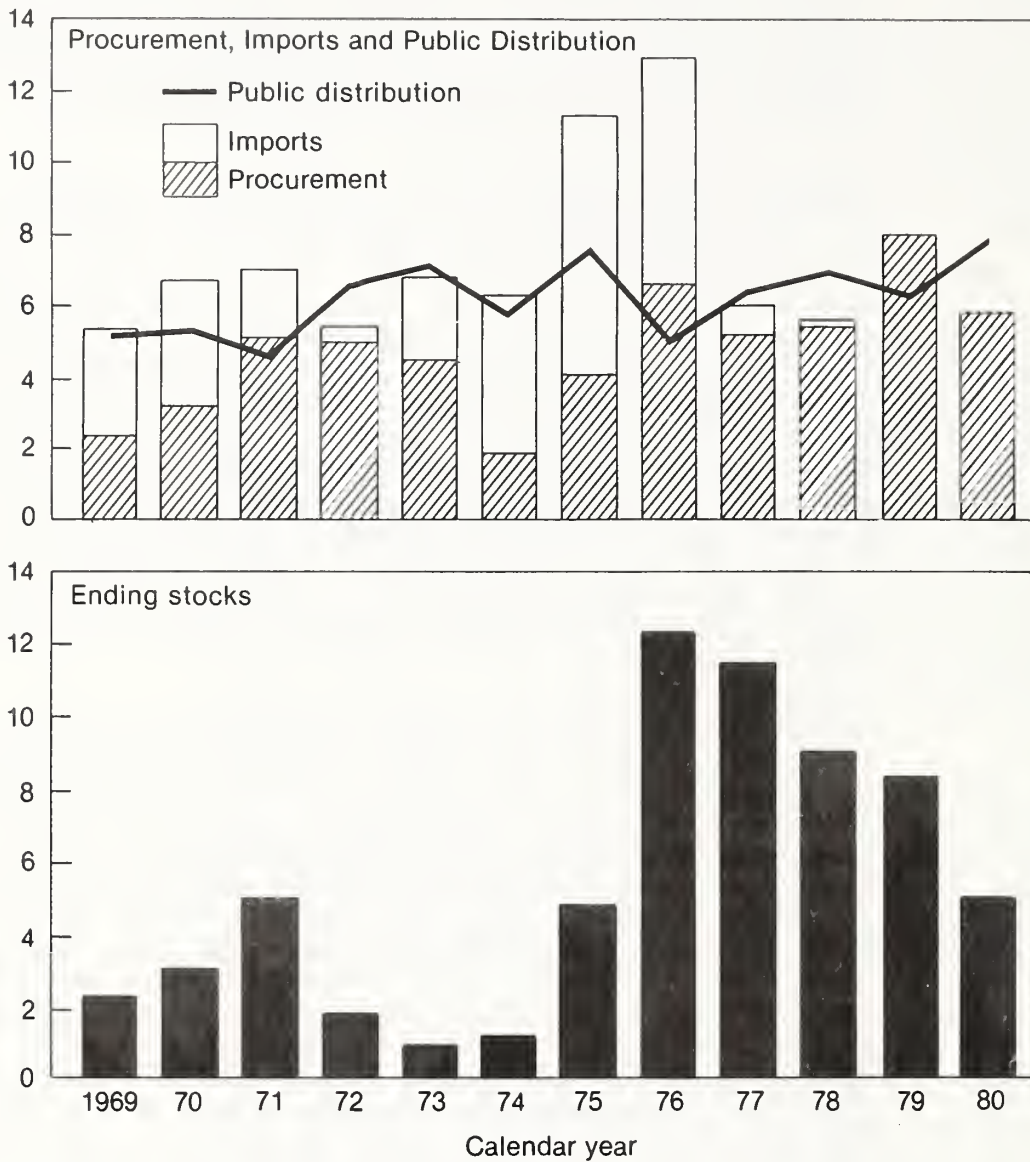
Production programs aside, the heart of food security policy in India has been the needs of the public distribution system and the decisions made to procure, stock, and import to maintain the viability of this system. India's public food system is perhaps the foremost example of such an endeavor; Government wheat stocks have reached 12 million tons and rice stocks, 8 million tons (figs. 2 and 3). The Government's rice operations have relied only minimally on imports (fig. 3). By contrast, in several years prior to 1975, wheat procurement was less than distribution, and in some years imports did not make up the

^{12/} Wall's analysis, although published in 1978, was written in 1976, before the full scale of the 1975-77 imports could be appreciated.

Figure 2

Supply and Distribution of Government Wheat Stocks in India

Million tons

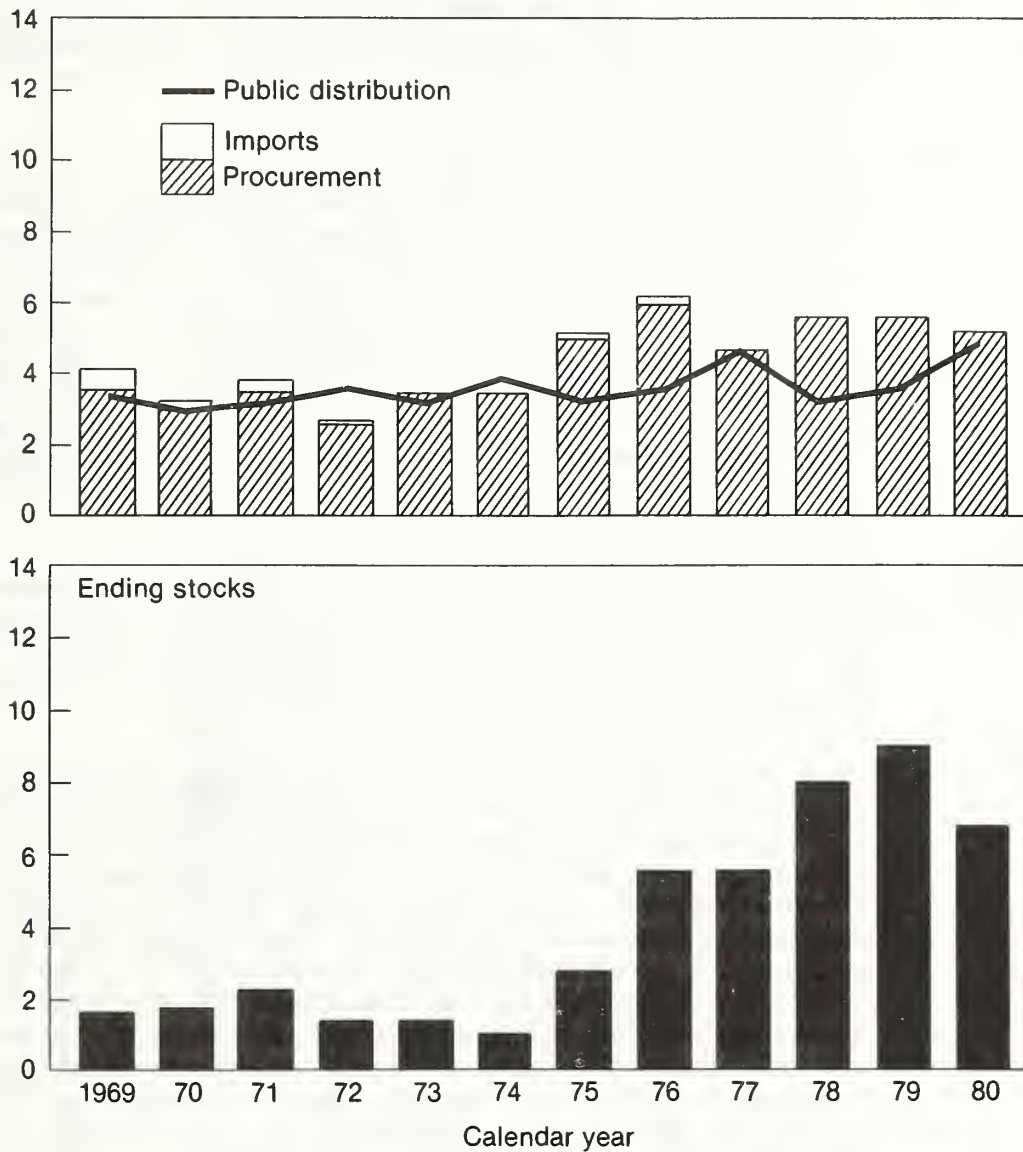


Public distribution excludes Food-for-Work program.
Source: Government of India.

Figure 3

Supply and Distribution of Government Rice Stocks in India

Million tons



Public distribution excludes Food-for-Work program.

Source: Government of India.

difference (fig. 2). Thus stocks declined. In 1975 and 1976, however, imports were large and stocks increased rapidly; in 1978, 1979, and 1980, imports were unnecessary, even though procurement was again less than distribution. These changes exemplify the choices which policymakers in India have had to make--namely how large a stock to hold, how much to import and when, and how much to attempt to procure (and thereby affect prices and production).

Results

Indian foodgrain consumption varied from 125 to 147 kg per person per year and showed no upward or downward trend during the analysis period.^{13/} The variability of per capita consumption was 5.0 percent, compared with 6.3 percent in per capita production. Variability in per capita rice and per capita wheat consumption was virtually the same, 6.7 and 6.6 percent, respectively, while in per capita rice and wheat production they were 7.5 and 9.0 percent (app. table 41). Per capita wheat consumption showed a fairly strong and upward trend (corrected R^2 of 0.61, slope = 0.9 kg/person/year), whereas there was no trend up or down in per capita rice consumption.

Mehra shows that the variability of production increased in each of the seven major foodgrains (she keeps finger millet and pearl millet separate) from the pre- to the post-Green Revolution periods (23, p. 18). The variability of total foodgrain production also increased slightly.

India imported about 500,000 tons of rice in both 1968 and 1969, but never more than 300,000 tons after that, and had net exports in 1978 and 1979. Concessional imports of rice were only occasional and not large. The bulk of food aid was wheat, which continued to be important from 1968/69 to 1971/72 but declined dramatically thereafter. Total wheat imports were generally 2 to 4 million tons, except in 1974/75 and 1975/76 when they exceeded 6 million tons; in 1977/78, 1978/79, and 1979/80, India was a net exporter of wheat (app. tables 13, 14, and 15). India's production, trade, and consumption records resulted in a self-sufficiency index for foodgrains that varied between 94 percent (in 1967/68) and 104 percent (in 1975/76), averaged 97.7 percent, and showed a moderate tendency to increase (app. table 11).

Policy Tradeoffs and Trends

India's food security policies have generally been balanced in their effects on consumers and producers, except for rural consumers. While producers had price supports and urban consumers had public distribution, rural consumers were assisted more indirectly. They have benefited from price supports to the extent that they were also producers or agricultural labor, and from public distribution to the extent that all food prices were stabilized. Rural consumers who are not producers, moreover, are a fairly small proportion of the rural

^{13/} See app. tables 34 and 39. Sarma also found no trend during 1950-77 (28).

population.^{14/} While it is difficult to assess whether support prices have been sufficiently high, Sanderson and Roy feel that in general "farmers' returns have been adequate...." (27, p. 5).^{15/} The effects of public distribution on food consumption by the urban poor are not easy to determine either, but George believes that when necessary, prices were held down and consumption was maintained by increased supplies of "fair-price" grain (11, p. 77). Mellor notes that relatively slow industrial growth in India contributed to a slow growth in the demand for food (24). This, combined with increases in food production, resulted in the elimination of imports.

India has long desired and (because of its size) needs to be nearly self-sufficient in foodgrains. India has successfully promoted higher food production and farm income.^{16/} By regularly maintaining the consumption of some of the poor through subsidies, India also increased its control over consumption. These benefits and increased self-sufficiency were secured at a politically acceptable fiscal cost.

Costs were more of a constraint in the storage program. While much has been made of the high level of stocks in India, much of the storage was technically inadequate. The high cost of construction for additional storage kept it from being a priority. India is currently receiving assistance from the World Bank to expand its storage facilities.

India has carefully balanced its rice and wheat programs. The cheaper food, wheat, has been used more in the distribution system than rice (by about 2 to 1) and has even been channeled into traditionally rice-eating areas. Remunerative wheat procurement prices have helped ensure steady increases in wheat production, while rice prices were not uniformly as remunerative and gains in rice production were not remarkable. Krishna and Raychaudhuri conclude that in the southern rice-producing states, procurement prices were below the cost of production (18, p. 45). This information dovetails neatly with Mehra's analysis, which concludes that yield variability has increased in association with the use of high-yielding varieties and fertilizer, but that assured irrigation has reduced or cancelled this increase in variability (23, p. 37). In the southern states, rice cultivation depends on field-to-field, gravity-fed irrigation (as opposed to tubewells in Punjab and Haryana). Yields in the south have not increased as much as in the north, and the variability of yields has increased in the south, and decreased in the north (23, pp. 23-24). Thus the lack of assured irrigation was a limiting factor in the south.

^{14/} Food-for-work programs have been significant only since 1979.

^{15/} See Krishna and Raychaudhuri for a detailed discussion of rice and wheat procurement prices (18).

^{16/} Ray, Cummings, and Herdt note that internal wheat prices have been higher than world prices, although rice prices were about the same internally and externally (26, p. 41).

In this situation higher procurement prices would likely have been an inefficient way of inducing higher production from an increasingly risky production system.

The Government has recently set some new goals. One is to increase pulse and oilseed production. These increases are expected to be accomplished, however, in ways that do not affect cereal production. The Sixth Plan (1978-83) also calls for an ambitious growth rate in irrigated area. Whatever facilities are added should permit higher and more stable yields in agricultural production, some in foodgrains. Mellor believes that India can now sustain an average growth rate of foodgrain production of 3.5 percent (23).^{17/} He also predicts that, "Once India adopts policies designed to accelerate industrial growth and employment, demand for food will rise sharply and be difficult to meet with domestic production alone."

A third goal (announced recently in the Prime Minister's 20-point plan) is to increase the size of the public distribution system. Even without such an increase, it is necessary to control the size of the food and fertilizer subsidies. The per unit subsidy of the public distribution system could be reduced to expand its coverage, but the broad coverage planned would almost definitely increase the total subsidy. Included in the food subsidy issue are procurement and issue prices, which obviously affect rice and wheat production and consumption. This subsidy is also affected by the level of stocks held (because of carrying charges), the timing of stock drawdowns and imports, and the amount of imports. Imported wheat is currently more expensive than domestic wheat.

India wants very much to be self-sufficient in cereals. However, there are many nuances possible in an operational definition of self-sufficiency. To what extent will domestic price increases be tolerated? Should India be considered self-sufficient (or self-reliant) if food can be imported without borrowing to do so? Do rice exports and wheat imports offset, and if so, on a calorie or value basis? In the near future, moderate levels of imports are most likely. On the one hand, India's generally acceptable version of self-sufficiency has given the leadership the latitude to import when necessary; on the other hand, the importance of self-sufficiency and India's tight foreign exchange situation reduce the likelihood of large imports.

INDONESIA

By 1970 Indonesia had begun to recover from the political and economic turmoil of the midsixties, but food security policymakers still remembered the hyperinflation of that period. Indonesia's rice imports in 1970 were already more than 10 per-

^{17/} Mellor also rightly notes that India's foodgrain self-sufficiency in the late seventies coexisted with large and unprecedented vegetable oil imports.

cent of total world imports, and both rice and wheat imports were heavily concessional. Per capita cereal consumption (which here includes rice, wheat, and corn) was 129 kg per person per year, fairly low for an Asian country at this time, but Indonesians have derived a substantial number of additional calories from cassava (table 5).^{18/} Around 1970 Indonesian food policy began to consider incentive prices for producers important. Both before and after 1970, however, the stability of the country has been measured mostly by the stability of retail rice prices; that is, consumers (particularly military or civil service consumers) have been the prime constituents of food policy.

Policy Actions and Emphases

Because the price stability of rice has been crucial, the Government of Indonesia has undoubtedly taken steps that it would have liked to avoid. In 1973, when the price of rice (and other commodities) skyrocketed, rice stocks were low in Indonesia and the country was forced to import about one-fifth of all rice imported in the world that year. About three-quarters of this rice were expensive commercial imports. Indonesia's rice and wheat imports became largely commercial from 1973 on, as its new oil revenues weakened the case for concessional imports. U.S. P.L. 480 shipments of rice, about 300,000 tons per year during the early seventies, were reduced or eliminated in the midseven-

Table 5--Indonesia: Consumption of cereals

Year	Rice	Corn	Wheat	Cereals ^{1/}
Kilograms/person/year				
1970	111	13	4.7	129
1971	111	12	3.3	126
1972	109	11	5.4	125
1973	118	19	3.8	140
1974	116	14	5.3	135
1975	114	14	4.5	132
1976	119	13	5.7	137
1977	121	15	6.0	141
1978	123	19	5.8	148
1979	130	15	6.9	153

^{1/} Includes rice, corn, and wheat; totals may not add due to rounding.

Sources: BULOG and USDA.

^{18/} This analysis of Indonesian staple food consumption is limited by the exclusion of cassava, which has not had good time-series data available. For a discussion of what is known, however, see Dixon (8).

ties, but returned to the 300,000-ton level again during the late seventies.

Another important step in stabilizing rice consumption for politically important consumers has been the distribution of rice by BULOG (the national logistics agency) to military and government employees. BULOG's total distribution of rice during the seventies ranged between 1.1 and 2.8 million tons; 600,000 to 700,000 tons per year went to the military and civil servants (app. table 20).

Indonesia has long wanted to become self-sufficient in rice. During the seventies, the high-yielding varieties of the Green Revolution and highly subsidized fertilizer promoted by the BIMAS (mass guidance) program, and increasingly appropriate and higher priority procurement activities kept production rising rapidly: 4.6 percent per year during 1965-73 and 3.4 percent during 1973-79 (app. table 5). Rising population and income, however, meant that imports could not be avoided. BULOG has controlled imports, procurement, stockholding, and public distribution of rice. Both technical support services and BULOG's support prices became more effective during the seventies. At the end of the decade, it was not clear whether the procurement system guaranteed all farmers a remunerative price for their crop, although the rate of increase of rice production (and yield) continues to be substantial. The Government has also affirmed the need to preserve the purchasing power of the consumer, and BULOG has defended the ceiling price successfully with open market sales (12, p. 2).

As food demand has grown, Indonesia has slightly relaxed its reliance on rice. Wheat imports have risen dramatically, and attention has been given to increasing corn production. Imports of flour disappeared as investment in mills permitted imports of wheat instead. The often-stated objective of rice self-sufficiency, further from achievement at the end of the seventies than at the beginning, was revised in 1979/80 to food self-sufficiency.

Results

During the seventies, the annual variability of per capita cereal consumption in Indonesia was 3.3 percent, the lowest among the six countries studied. The annual variability of per capita cereal production was also the lowest, at 4.6 percent.^{19/} Rice imports, which varied from half a million tons to 2 million tons, were the other major factor in the stability of consumption. These were facilitated since 1973 by significantly increased oil revenues. Finally, BULOG's improved technical competence in procurement and distribution has also helped stabilize consumption. Because food demand was also fueled by increases in national income, however, net cereal self-sufficiency showed a slight declining trend, averaging 89 percent (app. table 11). Indonesia's share of world rice imports,

^{19/} See app. table 41. Consumption includes rice, wheat, and corn; production includes rice and corn only.

moreover, increased at a (trend) rate of 1 percent per year during 1967-79.^{20/}

Indonesia is unusual in this study in that rice consumption was more stable (around its increasing trend) than cereal consumption. Per capita rice consumption was positively correlated with both per capita wheat consumption (0.70) and per capita corn consumption (0.63) (table 6).^{21/} Wheat consumption is basically equal to wheat imports, and wheat and rice imports often moved in parallel. Thus the Government has stabilized the price of rice by importing large quantities of both rice and wheat.^{22/} The correlation between rice and corn consumption is the indirect result of two likely negative correlations with cassava consumption. That is, rice-eaters and corn-eaters are each likely to consume cassava as an alternative source of calories.

Rice area harvested in Indonesia fluctuated during the seventies, but yield increased every year but one, rising 25 percent over the period. By 1979 it had reached 2 tons/ha (milled basis), significantly higher than yields in the Philippines, Bangladesh, and India (app. table 5). Rice production in Indonesia rose rapidly and with low variability during the seventies (app. tables 5 and 41).

Table 6--Indonesia: Correlations between and variability of per capita consumption of cereals, 1970-79

Item	: Correlation with per capita rice consumption	: Variability ^{1/} Percent
Per capita consumption of:		
Rice	1.0	2.7
Corn	.63	17.9
Wheat	.70	14.4
Cereals	--	3.3

-- = Not applicable.

^{1/} "Coefficient of variation": Standard error of regression of linear trend regression divided by the mean.

^{20/} FAO (Trade Yearbook) and USDA data on world imports differ, so the shares calculated from these sources differ, but both trends increase at about 1 percent per year.

^{21/} It must be re-emphasized that Indonesians derive 10 to 15 percent of their staple calories from roots and tubers, primarily cassava. The variability of staple consumption might thus be less than that of cereal consumption.

^{22/} Magiera reports a cross-price elasticity with respect to rice of 0.92 (¹⁹, p. 35).

In many ways, Indonesia presents a classic example of the dilemmas of food security policymaking. Its policies have been conditioned by the twin nightmares of inflation with concomitant political and economic instability and dependence on imports (and the possibility that they may not be sufficiently available).^{23/} Neither could be avoided without risking the other. As Timmer notes, stability has been both the primary goal of food security policy and a prerequisite to achieving other political and economic goals (32). For Indonesia, stability has meant imports, and while the share of imported cereals in consumption is not large compared with other Asian countries, the share of Indonesia's rice imports in world rice trade has been high. This unique dependence on the world market is an economic and political risk because of the importance of rice in the Indonesian diet and psyche, and because the demand for rice is price-inelastic.

Indonesian food policy has maintained a spread between consumer and producer prices to cover BULOG's marketing costs (10). In reality this has meant subsidized retail prices and sufficiently low producer prices, enforced with large imports. The price support program in rice has been gradually strengthened, but it is unclear whether this played a major role in increasing rice production. Mears points out, however, that rice producers in Java were the primary beneficiaries of production support programs, and other areas and producers suffered by comparison (21, p. 62).

Rice self-sufficiency, no nearer in 1979, was replaced by food self-sufficiency as a stated objective. Steps taken toward this goal include price support programs and technical assistance for several crops other than rice, corn in particular. Timmer is optimistic that Indonesia's multistaple food economy presents its policymakers with good opportunities to solve some of its food problems (31). He advocates raising the price of rice and subsidizing consumption of less-preferred staples. If politically acceptable, this would target subsidies to the poor. Rice consumption is spread across all income levels, however, so Timmer's program might not be looked upon favorably, even by the poor. The Government currently favors increases in its release prices of rice and wheat flour so that it can cut its subsidy cost.

Also on the horizon in the Indonesian food system are further benefits from the INSUS (special intensification) program, which began in 1979. Under this program, farmers make cultivating decisions in groups, the goal being to bring the quality of management and timeliness of debt repayment of all members up to that of the most progressive farmers. (BIMAS has had debt repayment problems during the last few years.) Remarkable increases in rice production are reported. As

^{23/} That is, a domestic food shortage leading to high food prices and general inflation because of the importance of food in total consumption.

part of the program, participants receive a somewhat higher support price for their rice. About 25 percent of all rice area and a greater share of production were under INSUS by mid-1981.

Rice production increased by more than 10 percent in 1980 and by almost 10 percent again in 1981. A combination of factors--good weather, INSUS, increased use of fertilizer, diminished pest problems--has accounted for these increases. At the same time rice imports dropped from 2 million tons in 1980 to 500,000 tons in 1981. Which part of Indonesia's near self-sufficiency in rice is due to 'permanent' factors and which part to transitory ones is difficult to assess, but some analysts predict continued strong increases in production. If these predictions are accurate, Government outlays for supporting producer prices might increase while the import bill decreases. Currently Indonesia's Government rice stocks are also largely the result of the price support program. These stocks reached the unprecedented level of over 2.5 million tons in 1981. This level is burdensome in that facilities are inadequate and the average time in storage is quite long. The high cost of such a large procurement and storage program may be a constraint on rice self-sufficiency in the future, unless price supports and procurement can be reduced without significantly affecting production. Mears believes that rice self-sufficiency will be difficult to reach and maintain (22, pp. 417ff.). Indeed, risks from new or mutated pests and from bad weather mean that even in a generally self-sufficient scenario, substantial imports of rice may occur.

REPUBLIC OF KOREA

This analysis of Korean food policy covers rice, wheat, and barley during 1966/67 to 1978/79.^{24/} At the beginning of this period, the national average rice yield had already surpassed 3 tons/ha (milled basis) in several years. The year 1967 was "easy" for rice: imports were small, and none were concessional. In 1969 and the early seventies, this was not the case. Wheat imports were substantial in 1966/67--780,000 tons--but the concessional share was much smaller than it had been during the sixties.

In 1966/67, per capita cereal consumption in Korea had already passed 180 kg/person/year, supported by high production and rapidly growing income. Net cereal self-sufficiency stood at the highest level of the 13-year period--89 percent.

Many of Korea's food policies during the sixties can be traced back to World War II.^{25/} There were disruptions in the grain economy at that time, and several instances of soaring grain prices between World War II and the Korean War. These resulted in Government controls on grain marketing which have been removed only briefly since. Indeed the "basic legal authority

^{24/} Split years for Korea are rice, November-October; and wheat and barley, July-June.

^{25/} For a good history of Korean food policy, see (25).

for foodgrain policy" is still the Grain Management Law, passed in 1950, which gives the Government the authority "to regulate...all phases of all transactions in grain" (25, p. 388).

Policy Actions and Emphases

While the Government of Korea has not fully exercised its authority to regulate grain transactions, it has performed many aspects of food grain marketing, some of them solely. It has procured, stored, distributed, and has been the only importer of rice and barley. It has controlled the price of wheat and ordered barley mixed into both wheat and rice.

Historically the major emphasis of food security in Korea was low rice prices (25, p. 392). During the late sixties, however, the focus of Korea's food policy began to shift perceptibly from the consumer to the producer. Low rice prices had been maintained by imports (primarily wheat and barley), and open market sales of all grains (25). These low rice prices had protected consumer welfare and kept industrial wages down. With rising incomes, rice and cereal consumption became smaller parts of total consumption, so the effect of cereal price inflation on general inflation was lessened. The disparity between farm and nonfarm incomes also grew, partly as a result of low producer prices (25, p. 392). The new policy aimed both to equalize incomes and promote self-sufficiency. The procurement price for rice was raised significantly each year from 1968 to 1973. Indeed for rice Anderson shows that during this period, the nominal protection coefficient--the ratio of domestic to border prices--continued to increase and first exceeded 1.0 (2).

The Korean Government committed itself during this same period to an intensive rice production program, which included fertilizer available at "low" prices and strong promotion of improved varieties (25, p. 384). The program also stepped up the procurement of rice from domestic production. Even though rice self-sufficiency was an important goal, Korea found it necessary to import rice more heavily during the early seventies.

Staple substitution is a policy prerogative which has always appealed strongly to Korean policymakers. During the fifties and sixties, wheat and barley imports stabilized rice prices. During the late sixties, a two-price system (with a subsidy between the producer and consumer prices) was instituted for barley to encourage consumers to eat more barley and less rice. In addition rice served in restaurants and brought by school children for lunch has been required to be mixed with varying amounts of barley. Barley has been ordered mixed into wheat for flour production, and wheat prices have been controlled to affect rice prices.

Results

Per capita cereal consumption in Korea varied annually an average of 6.8 percent over the 13-year period (table 7). This is the highest variability among the countries studied. Per capita cereal production varied 5.8 percent, which was the

Table 7—Korea: Per capita consumption of cereals

Year	Rice	Barley	Wheat	Cereals ^{1/}
Kilograms/person/year				
1966/67	125	35	21	182
1967/68	118	35	26	179
1968/69	115	37	32	184
1969/70	136	34	45	215
1970/71	144	31	45	220
1971/72	113	34	46	193
1972/73	112	34	41	188
1973/74	133	35	38	206
1974/75	110	41	36	187
1975/76	131	27	33	191
1976/77	122	37	41	200
1977/78	160	19	38	217
1978/79	153	18	33	204

^{1/} Includes only rice, barley, and wheat; totals may not add due to rounding.

average for the six countries (app. table 41).^{26/} By comparison, per capita rice consumption and production varied 11.7 and 8.9 percent, respectively; per capita wheat consumption, 20.4 percent; and per capita barley consumption and production, 18.2 and 13.3 percent, respectively. Again, the variability of rice consumption was significantly higher than in the other five countries; the variability of rice production was also higher, but not by as much. There were several reasons for the high value of the variability of rice consumption. Perhaps the most important was inaccuracy in the data, particularly on production. If rice production has been overstated in recent years, as it seems, then the true variability of production and consumption is lower than calculated. In some years, moreover, the effect of policy was probably procyclical (that is, destabilizing), for example, when rice consumption was encouraged in years of high production. Finally problems in scheduling imports, including P.L. 480 shipments, also show up as destabilizing in this annual analysis.

The correlation between per capita rice and barley consumption was strongly negative, -0.85, as barley was used to fill the gaps in rice availability (table 8). Rice and wheat consumption were not correlated (0.09). The level of cereal consumption in Korea has also been much higher than elsewhere, varying

^{26/} Consumption includes rice, wheat, and barley; production includes rice and barley.

Table 8--Korea: Correlations between and variability of per capita consumption of cereals, 1966/67-1978/79

Item	Correlation with per capita rice consumption	Variability <u>1/</u> Percent
Per capita consumption of:		
Rice	1.0	11.7
Barley	-.85	18.2
Wheat	.09	20.4
Cereals	--	6.8

-- = Not applicable.

1/ "Coefficient of variation": standard error of regression of linear trend regression divided by the mean.

from 179 to 220 kg/person/year, and showing no strong trend up or down (table 7 and app. table 39).^{27/}

The importance of food aid declined significantly in the mid-seventies, although Korea continued to import about 1.5 million tons of wheat per year (app. table 14). As the rice production program began to take effect--the national average rice yield reached almost 5 tons/ha (milled basis) in 1977--the level of rice imports decreased from almost 1 million tons in 1971 to virtually zero in 1978 (app. table 13). Korea was thus self-sufficient in rice in 1977/78, allowing for releases of 375,000 metric tons of rice from Government and household stocks. The cost of this increased production has been very high, however. By the end of the seventies, Korea supported the price of rice at more than twice the border price (2). The Government's rice was resold to consumers at a loss, yet consumers also paid much more than the border price. At the end of 1980, the Government's cumulative deficit from the dual price systems for rice and barley was more than 10 percent of its total expenditures. In spite of efforts by policymakers and farmers alike, net cereal self-sufficiency averaged only 75 percent and showed no upward (or downward) trend (app. table 11). Ironically, cereal self-sufficiency was highest (89 percent) in 1966/67.

Policy Tradeoffs and Trends

In some ways, Korean policymakers have been the most intrusive of those studied. While they have not operated a large-scale ration scheme for the benefit of a particular group, they have taken many other steps to control the foodgrain markets. Where other governments have stopped at wholesale or retail market-

^{27/} With cereal consumption so high, one might hypothesize that it is on a plateau from which it will not increase, but there is no real evidence to support this assertion.

ing, the Korean Government has modified consumption patterns directly, dictating mixtures of rice and barley to be eaten, as well as the degree of polish or extraction of each food-grain. These parameters were often changed annually. It was as if Korean policymakers simultaneously believed in and distrusted the grain markets. Open market sales of procured or imported rice were used to restrain a rise in the price of rice, indirectly raising consumption. At the same time, citizens were "exhorted," on patriotic grounds, to eat rice mixed with barley voluntarily at home, as well as by law in restaurants.

Huh discusses the Government's roles in marketing and its price policies for a variety of agricultural products (16, p.163). He believes that many farmers do not trust the Government because it frequently changes its programs and because it does not take full responsibility for them. He feels the Government's interventions have sometimes been destabilizing.

For all their efforts, the Koreans have achieved very high rice yields, but not lasting self-sufficiency. The high levels of production seem unstable, too. Since 1977 there have been significant decreases in the area planted to the high-yielding varieties of rice so heavily promoted by the Government, and in 1980 there was a catastrophic failure of the rice crop due to cold weather, to which the high-yielding varieties were unfortunately susceptible. As a result Korea had to import over 2 million tons of rice, about one-third of its consumption, and the Government has actually de-emphasized the use of high-yielding rice varieties.

Korea shifted away from a low-price policy, which did not stimulate production and usually was accompanied by high imports. The high-price policy brought with it a high subsidy burden and the increased riskiness of high-yielding varieties.^{28/} By paying year after year to maintain a high-capacity foodgrain production system, Korea has revealed how precarious it feels in the world political economy. Clearly, stability and security are not issues to be taken lightly in Korea; no future policy initiative is likely to ignore them.

PHILIPPINES

This analysis of Philippine food security policies spans 1968/69-1979/80.^{29/} During this period, the Green Revolution began to take effect in the Philippines: 1968/69 was the last year of normal weather in which the national average rice yield was less than 1 ton/ha (milled basis). This yield tended to increase throughout the period.

^{28/} Because of differences in both climate and preferences, rice varieties in Korea will always be very different from those in South or Southeast Asia.

^{29/} Split years regarding the Philippines refer to July/June years for all commodities, namely, rice, wheat, and corn.

By 1968/69, the Philippines imported about half a million tons of wheat per year to supplement its domestically produced rice and corn. The amounts of wheat imported and consumed did not fluctuate significantly over the period, however, nor did they increase significantly over the pre-Green Revolution period level. Per capita cereal consumption was only 109 kg per person per year in 1968/69, but recovered the following year to a more normal level somewhat over 120 kg/person/year (app. table 34).

From a political economic point of view, the analysis covers both the martial law period (from September 1972 on) and several years before martial law. This is important to note because the Government's perceived accountability may influence the time horizon over which it sets goals and implements policies. President Marcos was first elected in 1965 and had promised to ban rice imports to encourage local production. Thus in 1968/69 Philippine policies were changing from low prices for political and economic stability and protection of urban consumer welfare to a more balanced treatment of producers and consumers.

Policy Actions and Emphases

To satisfy food demand, Philippine policymakers have mostly relied on privately marketed production and Government-controlled imports. Until very recently, the Government apparently felt it unnecessary or unwise to become involved in public distribution schemes or even modest buffer stocks to complement its import and open market sales operations. Apiraksirikul and Barker suggest that the country's actual objective until the midseventies, in spite of the stated goal of rice self-sufficiency, may have been production "slightly below" self-sufficiency:

With the exception of 1973 when world rice prices were extremely high and supplies scarce, and a few years of 'political importation,' this policy may in fact have been less costly than completely eliminating rice imports (3, p. 579).

Regardless of which self-sufficiency objective was pursued, few have disagreed that the early emphasis of Philippine food policy was price stability around a price level low enough to be a means to political and economic stability.^{30/} Apiraksirikul and Barker argue for the consumer bias of early policy and estimate the gains or losses made by the Government from the sale of imported rice. There was a loss in 3 of the 4 years from 1968/69 to 1973/74 for which they made estimates. Over the period of this analysis, however, there have been some shifts in price policy. During the latter half of the seventies, for example, floor prices for rice became effective and have provided "sufficient" incentives to rice producers (13).

Philippine policymakers are also probably more wary now of relying on imports. An important reason for this is the traumatic experiences of 1972-73, with floods and drought in the

^{30/} See, however, Bouis (5).

Philippines and a shortage of rice on the world market. The strong increases in rice production during the late seventies, however, have provided the excess supply necessary for a buffer stock. Moreover the only time that the Philippines had to rely on cereal substitution to any significant extent was 1973, when a mixture of rice and corn grits was rationed to Filipino families.

A significant policy thrust of the Philippines has been the Masagana 99 rice production program, which began in 1973. Its main tools are credit, a fertilizer subsidy, and extension services (20, p. 300). Together with a more effective producer price support program, the technical and financial services of Masagana 99 have clearly been instrumental in boosting rice production. The burden of the fertilizer subsidy has varied, depending on the world price; it peaked at 40 percent or more of the fertilizer cost in 1975 (14, p. 7; 5).

Results

Rice production increased at an annual rate of 3.2 percent during 1965-73 and 5.7 percent during 1973-79 (app. table 5). These increases were due primarily to higher yields, although in 1979 the yield of milled rice in the Philippines was still quite low at 1.39 tons/ha.

In spite of these increases, per capita rice consumption showed no tendency to increase over the period, nor did per capita cereal consumption (app. table 39). That is, from 1971/72 on, rice production increases tended to replace imports (which had been largely concessional) and self-sufficiency increased (app. table 10).^{31/} The Philippines was also self-sufficient in rice the 3 years before 1971/72, however. Rapid population growth (2.6 percent) also prevented per capita consumption from increasing.

The annual variability of per capita rice and cereal consumption was the second highest studied, 7.0 and 5.6 percent, respectively (app. table 41). The variability of rice and cereal production was also high.

Policy Tradeoffs and Trends

Until recently, the Philippines' food security policies were notable for not using public procurement and distribution. The importance of political and economic stability in these policies is not unusual, but the Philippines chose to pursue these goals by relying heavily on imports. A conscious acceptance of less direct control of the country's food supply may have been implicit in this strategy, or there may have been significant constraints to a more interventionist strategy. Before 1973, rice had always been readily available on the international market, so it was not unreasonable to depend on imports to supplement domestic supplies. The events of 1972-73, however, reinforced an incipient trend toward self-sufficiency. The

^{31/} The concessional rice imports of 1971-74 were the only important instance of food aid in the Philippines during the period of analysis.

Masagana 99 program provided several of the elements necessary to significantly increase production, and the well-defended floor prices of the late seventies were particularly effective as a followup. Thus the Philippines improved its self-sufficiency, reducing its reliance on imports. At the same time, its effective floor prices have backed the Government into procurement and stockholding. The stockholding, in turn, can promote food security or support exports.

The earlier strategy of the Philippines was a lower cost, lower benefit strategy. It relied on imports, which were probably a cheaper but less stabilizing solution to a deficit in market supply than a buffer stock. There was no other major program to promote food consumption. During the early seventies the Philippines had a lower level of per capita cereal consumption than most of the other countries in the study, and for its income level seems to have had lower total caloric intake (app. table 34 and table 9). It also had relatively unstable per capita rice and cereal consumption (app. table 41).

By the end of the seventies, the Philippines was more similar to the other countries studied, with more involvement in procurement and stockholding (app. table 22). It thus seemed to be pursuing a higher cost option. This course may or may not lead to higher levels of consumption and/or lower variability in consumption. An important factor here will be whether food "surpluses" are exported, as some Philippine statements have claimed. Whether self-sufficiency or exporting is economically justifiable will depend on the world price of rice, which is

Table 9--Per capita income and caloric intake in the Philippines and four other Asian countries 1/

Country	: Intake per : capita, 1972-74 :	: Calories as : percentage of : requirement 2/:	: GNP per capita, : 1971
	: <u>Calories</u>	: <u>Percent</u>	: <u>U.S. dollars</u>
Bangladesh	: 1,949	: 84	: <u>3/62</u>
Indonesia	: 2,033	: 94	: 71
India	: 1,970	: 89	: 108
Philippines	: 1,953	: 86	: 203
Korea	: 2,749	: 117	: 268

1/ A 1972-74 requirement was not calculated for Taiwan because it was no longer a member of FAO. Taiwan's intake (see table 3) and percentage of requirement figures are similar to those for Korea; its per capita income is higher.

2/ FAO calories and requirements.

3/ 1973.

Sources: FAO Fourth World Food Survey, 1977. GNP calculated from IMF International Financial Statistics, 1980 Yearbook.

likely to remain low for several years. Even if the Philippines can produce rice for less than the world price, however, the ability and desire to export rice will depend on the cost of maintaining stocks to support exports and the quality of Philippine rice, which to date is low. Thus an export strategy is unlikely.

Rather, Philippine policymakers are likely to set a small exportable surplus as their target. If this is achieved, the country would be self-sufficient in rice and would have a stock level capable of making up for normal fluctuations in production. To implement such a strategy, price supports (or input subsidies) would not have to be increased. Whether per capita consumption increases or not will depend on whether there are still geographic and/or technical areas in which substantial increases in productivity can be readily achieved.

TAIWAN

This analysis of Taiwan's food security policies covers rice and wheat during 1968/69 to 1979/80.^{32/} Long before the Green Revolution in the rest of Asia, Taiwan's agricultural sector began to develop and become more productive. Major investments in irrigation, strong research and extension programs, and effective land reform were important factors in this development. Milled rice production and average yield had reached plateaus of about 2.3 million tons and 3 tons/ha, respectively, by 1968/69. These levels changed only marginally over the period of analysis. Taiwan produces almost no wheat, but consumption of wheat products is substantial. At the beginning of the analysis period, about 600,000 metric tons of wheat were imported annually.

Early income growth led to increases in per capita rice consumption, a trend which peaked during the fifties (6, p. 74). By 1970/71 per capita rice consumption had decreased to about 140 kg/person/year. Per capita wheat consumption, on the other hand, was increasing at the beginning of the period of analysis. Because of its early development, Taiwan was a rice exporter during the fifties and sixties (6, p. 78). By 1970, however, Taiwan was only a marginal exporter of rice. Exports of industrial goods have played a key role in Taiwan's economic development. Taiwan's agricultural sector, however, has played a crucial supporting role: by producing food efficiently, the agricultural sector has supplied Taiwan's industrial labor force with low-cost food.

With rice originally a large part of total food consumption and food a large part of total expenditures, the price of rice was an extremely important parameter in Taiwan's development. An increase in the price of rice could have led to higher wages and less competitive exports. Thus a major pre-1970 goal of

^{32/} Split years in reference to Taiwan are July/June. For a detailed analysis of Taiwan's early rice policies, see Chen, Hou, and Mao (7).

Taiwan's food policy was cheap rice. It derived substantial revenue from land taxes and related programs, and controlled a significant share of the rice marketed.

Policy Actions and Emphases

By the beginning of the seventies, continued growth in income and nonfarm employment had resulted in diversification of the diet and lower profitability of rice farming relative to other crops. With the importance of rice in the diet significantly diminished, the need to hold down rice prices decreased. At the same time Taiwan officials decided that the widening gap between nonfarm and farm incomes should be narrowed. Thus in 1973 they abolished the fertilizer-rice barter system, an implicit tax on the agricultural sector, and introduced guaranteed, high producer prices. Taiwan has retained its position in domestic marketing, however, as consumer welfare and economic stability are still important objectives. Thus the Provincial Food Bureau continues to engage in procurement, storage, and open market sales of rice to stabilize rice prices. The external trade in rice, but not in wheat, is under official control. Nevertheless wheat consumers in the midseventies were subsidized (to mitigate the effects of rapid price increases) and are now being taxed to repay this subsidy.

The high productivity of rice farming in Taiwan gave rise to rice exports during the fifties and sixties. In the early seventies, however, the export possibilities were reduced because of subsidized exports by Japan, while the returns to rice farmers were being squeezed by high labor costs and low prices. Fearing excessive declines in production, Taiwan felt it necessary to make rice self-sufficiency a national goal. The world food shortages of the early seventies reinforced Taiwan's determination to remain self-sufficient in rice. In 1975 Taiwan established 450,000 tons as the target level for a rice buffer stock.

Results

Taiwan is unique in this study in that per capita rice consumption declined steadily over the period of analysis, from about 140 to less than 100 kg/person/year (table 10). Per capita cereal consumption also began dropping about midway through the period (app. table 34). The variability of consumption is also important, as it is a measure of disruptions from a trend. The variabilities in both per capita cereal and rice consumption were moderate, 5.2 and 6.1 percent per year, respectively (app. table 41).

Taiwan has remained self-sufficient in rice, as a negative income elasticity and growing population have resulted in virtually unchanging aggregate consumption (table 10 and app. table 10). Taiwan relies almost entirely on imports for its wheat, however; thus from 1968/69 to 1979/80, between 20 and 30 percent of foodgrain consumption was imported (app. table 19).

By the end of the seventies, Taiwan's new food policies resulted in a bulging granary. With strong production incentives and poor export opportunities (even at subsidized prices), Taiwan had accumulated a large amount of rice, and its marketing

Table 10--Taiwan: Aggregate and per capita consumption of rice and wheat

Year	Aggregate consumption <u>1/</u>		Per capita consumption	
	Rice	Wheat	Rice	Wheat
	1,000 metric tons		Kilograms/person/year	
1968/69	1,907	418	132	30
1969/70	2,258	387	152	27
1970/71	2,139	334	140	22
1971/72	2,165	392	139	26
1972/73	2,160	433	136	28
1973/74	2,261	507	139	32
1974/75	2,166	483	131	30
1975/76	2,116	426	125	26
1976/77	2,137	461	124	27
1977/78	2,018	452	115	26
1978/79	2,033	480	114	27
1979/80	1,749	515	96	29

1/ Gross milled basis: waste/losses have not been subtracted.

program was encountering a shortage of storage capacity (app. table 20). Only small amounts of old rice could be disposed of as feed.

Policy Tradeoffs and Trends

Taiwan has the highest per capita income, the lowest percentage of GNP from agriculture, and probably the least undernutrition among the areas studied. It is therefore important to note that Taiwan's policymakers still feel the need to formulate and implement a variety of food security policies. This need stems partly from Taiwan's unique political situation. Although it has achieved sustained economic growth through international trade, Taiwan continues to scrutinize the international markets for opportunities to diversify both its sources of supply and export markets. Taiwan will likely remain self-sufficient in rice, but will equally likely remain dependent on imported wheat.

Taiwan's past strategy of economic development called for cheap food, which the agricultural sector was able to provide. As the structure of the economy changed, so did the objectives of food policy. Equity of income became more important as the gap between farm and nonfarm incomes widened and self-sufficiency became more important during the seventies. Chen, Hou, and Mao have estimated the priorities (in percentages) accorded various rice policy objectives before and after 1970 as follows (7):

Objective	:	
	: Before 1970	: After 1970
	:	
	:	
	Percent	
Farmers' income	0	30
Consumers' welfare	30	30
Government revenue	30	0
Foreign exchange	10	0
Self-sufficiency	0	20
Economic stability	30	20
	:	
Total	100	100
	:	

Taiwan presently subsidizes rice production through guaranteed producer prices, exporting at a loss in some years, and maintaining a buffer stock. Although an excess supply of rice has persisted for several years, eliminating it has not been a high priority. The producer price subsidy, however, has been limited since 1977, when Taiwan decided to pay the support price only on the first 970 kg/ha of rice.

Taiwan will continue trying to maintain a balance between rice production and consumption. Aggregate rice consumption has begun to decline gradually, and officials have set the 1983 rice production target below that of 1982, which in turn was lower than that of 1981. How they hope to achieve this target when other conditions, particularly the high producer price, remain the same has not been explained (restrictions on irrigation are one option contemplated). Taiwan's buffer stock results partly from high producer prices. This stock will likely be retained, as protection in the event of a production shortfall and on the general principle of national security. Major production shortfalls—at least those due to adverse rainfall—are not likely, however, since Taiwan's farmers have excellent access to irrigation water.

Taiwan's policymakers are also wrestling with the issue of farm structure. With rising costs, farms are now considered too small to be efficient or to provide enough income to their operators. Thus officials plan to encourage farm enlargement and mechanization and will subsidize energy and fertilizer use. These steps are intended both to raise farm income and to promote the continued transfer of labor from agriculture to the growing industrial sector. The attachment of Taiwan's landowners to their land may, however, constrain enlargement.

The events of 1965-75 strongly affected the thinking and actions of Asian food policymakers. Political and/or economic instability was traumatic at times (especially during the weather-related calamities of 1972-74); this instability will not soon be forgotten. This instability enhanced the justification for consumer price protection directly, but better production technology and infrastructure have enhanced the ability of policymakers to meet food needs from domestic supplies, and price support programs are now more effective than they were 10 or 15 years ago. Some countries are approaching self-sufficiency, a widely proclaimed goal, although adoption of high-yielding technology often leads to greater variability in food production. For this reason and others, the need for additional food security measures, like buffer stocks, has been realized. Except for drawdowns in 1973/74, per capita government rice stocks generally grew during the seventies.^{33/}

Buffer stock programs began only during the last decade in developing countries, due to the fiscal and administrative costs involved and the previously easier world food situation. Buffer stocks are useful adjuncts to other government marketing interventions, but are a drain on scarce administrative talent. Imports can also make up for shortfalls in production, but their perceived reliability was probably damaged disproportionately during 1972-74. Nevertheless, state trading in foodgrains is widespread because governments feel a need to control this important element of supply.

Because of considerable expenditures of financial and manpower resources on imports, stocks, ration schemes, and other related activities, policymakers have almost always been able to keep cereal availability more stable than cereal production, especially in the poorer countries (table 11). Moreover, this record of consumption stability was achieved despite unprecedented disruptions in the world food economy.

Rice is the most important cereal consumed in all the countries studied. Accordingly, much of the resources expended in food security programs stabilize, directly or indirectly, the availability of rice. Because of these countries' policies, rice availability has been more stable than wheat availability (except in India, where they share the position of primary cereals) or that of other important cereals (table 11). Moreover, while rice consumption was generally more stable than rice production, consumption of secondary cereals was less stable than their production. Aggregate cereal availability, however, has been more stable than that of rice, because of the generally negative correlations (compensating fluctuations) between the availability of primary and secondary cereals (app. table

^{33/} See app. table 22. The same is true of wheat stocks in Bangladesh and India.

Table 11--Variability of per capita production and consumption of cereals 1/

Cereal and country	Variability of per capita consumption	Variability of per capita production
	<u>Percent</u>	
All cereals:		
Bangladesh	3.4	5.9
India	5.0	6.3
Indonesia	3.2	4.6
Republic of Korea	6.8	5.8
Philippines	5.6	6.7
Taiwan	5.2	5.5
Rice:		
Bangladesh	4.8	6.3
India	6.7	7.5
Indonesia	2.7	3.0
Republic of Korea	11.7	8.9
Philippines	7.0	7.5
Taiwan	6.1	5.4
Wheat:		
Bangladesh	34.5	25.6
India	6.6	9.0
Barley:		
Republic of Korea	18.2	13.3
Corn:		
Indonesia	17.1	15.9
Philippines	9.0	6.6

1/ Variability is calculated using a "coefficient of variation": The standard error of the regression (of a linear trend regression) divided by the mean.

40).^{34/} The governments of these countries have implemented a variety of food policies which use staple cereal substitution, ranging from the emergency mixing of corn grits and rice in the Philippines in 1973 to the more regular "encouragement" of a specific (and changing) barley-rice mixture in Korea and the use of wheat in the ration system for traditional rice-eaters in Bangladesh and India.

^{34/} Indonesia does not conform to this pattern for cereals, but it is likely that a negative correlation exists with cassava consumption.

Although food security policies in the six Asian countries were discussed in similar terms, the countries themselves are more different than similar. In comparing policies one must be careful not to assume that the same objectives or instruments are feasible everywhere. Broadly speaking, farmers in all the countries adopted the new technologies of the Green Revolution during the sixties and seventies (except in Taiwan, where farmers had already made considerable progress). The state has controlled trade in foodgrains, and originally stabilized consumption with imports (again, except in Taiwan) and later also with buffer stocks built partly from domestic production. The wealthier countries tend to hold larger government stocks (per capita) and also to experience greater variability in consumption. These conditions reflect the greater importance of producer income parity in these countries: the level of stocks is the result more of price support operations than of consumption stabilization.

Beyond these generalizations, one discerns strong differences. Large countries like India and Indonesia can necessarily depend on the international market for a smaller share of consumption than small countries. Yet the rice and wheat imports of even India and Indonesia as a percentage of consumption are quite different. Staple substitution is a major policy tool in some countries (Korea) but hardly used in others (Philippines). Self-sufficiency is the stated goal of all, but its achievement varies significantly. The most valid generalization that can be made is that food security will continue to be a vital concern of policymakers in all of these countries.

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APPENDIX TABLES

Unless otherwise noted, year headings in the appendix tables should be interpreted in the following manner. The year 1972, for example, means the years shown below.

Bangladesh	1972/73
India	1971/72
Indonesia	1972
Korea	1971/72
Philippines	1972/73
Taiwan	1972/73

APPENDIX TABLE 1--RICE PRODUCTION, MILLED 1/

COUNTRY	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
	1,000 METRIC TONS												
BANGLADESH	-	-	-	-	-	10089	11909	11287	12762	11751	12965	12850	12200
INDIA	-	37612	39761	40430	42225	43068	39245	44050	39579	48740	41917	52670	53770
INDONESIA	-	-	-	13140	13724	13183	14607	15276	15185	15845	15876	17525	17918
REPUBLIC OF KOREA	3919	3603	3195	4090	3939	3998	3957	4212	4445	4669	5215	6006	5300
PHILIPPINES	-	2889	3401	3472	3310	2865	3630	3673	3757	3938	4206	4642	4730
TAIWAN	-	2342	2159	2291	2152	2270	2097	2280	2319	2523	2384	2200	2205

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.

APPENDIX TABLE 2--WHEAT PRODUCTION 1/

COUNTRY	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
	1,000 METRIC TONS												
BANGLADESH	-	-	-	-	-	88	107	113	113	211	250	342	494
INDIA	-	16540	18651	20093	23832	26410	24735	21778	24104	28846	29010	31749	35510
INDONESIA	-	-	-	0	0	0	0	0	0	0	0	0	0
REPUBLIC OF KOREA	193	191	211	224	219	196	149	100	108	97	82	45	36
PHILIPPINES	-	0	0	0	0	0	0	0	0	0	0	0	0
TAIWAN	-	17	10	4	2	2	1	0	3	1	0	0	0

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.

APPENDIX TABLE 3--BARLEY PRODUCTION 1/

COUNTRY	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
BANGLADESH	-	-	-	-	-	-	-	-	-	-	-	-	-
INDIA	-	3504	2424	2716	2784	2577	2379	2371	3135	3192	2344	2311	2140
INDONESIA	-	-	-	-	-	-	-	-	-	-	-	-	-
REPUBLIC OF KOREA	1632	1550	1680	1666	1591	1510	1600	1443	1388	1700	1759	814	1348
PHILIPPINES	-	-	-	-	-	-	-	-	-	-	-	-	-
TAIWAN	-	-	-	-	-	-	-	-	-	-	-	-	-

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.

APPENDIX TABLE 4--CORN PRODUCTION 1/

COUNTRY	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
BANGLADESH	-	-	-	-	-	-	-	-	-	-	-	-	-
INDIA	-	6269	5701	5674	7486	5101	6388	5804	5559	7256	6361	5973	6200
INDONESIA	-	-	-	2825	2606	2254	3690	3011	2903	2572	3143	4029	3305
REPUBLIC OF KOREA	-	-	-	-	-	-	-	-	-	-	-	-	-
PHILIPPINES	-	1733	2008	2005	2013	1831	2289	2568	2767	2843	2854	3167	3180
TAIWAN	-	-	-	-	-	-	-	-	-	-	-	-	-

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.

APPENDIX TABLE 5---RICE YIELDS AND ANNUAL GROWTH RATES OF
RICE PRODUCTION 1/

COUNTRY	GROWTH RATES OF RICE PRODUCTION		YIELD, 1979, <u>2/</u>
	EARLIER PERIOD	LATER PERIOD	
	<u>PERCENT</u>		<u>MT/HA</u>
BANGLADESH (1973-79)	-	1.2	<u>3/</u> 1.27
INDIA (1967-73, 1967-79)	1.8	1.9	<u>3/</u> 1.33
PHILLIPINES (1965-73, 1973-79)	3.2	5.7	1.39
INDONESIA (1965-73, 1973-79)	4.6	3.4	2.02
REPUBLIC OF KOREA (1960-70, 1970-77)	2.1	<u>4/</u> 5.9	4.51
TAIWAN (1960-70, 1970-79)	2.5	0	3.06

- = NOT APPLICABLE.

1/ GROWTH RATES FROM SEMI-LOG TREND EQUATIONS.

2/ MILLED BASIS.

3/ 1978.

4/ DECREASING, 1977-80.

APPENDIX TABLE 6--PER CAPITA RICE PRODUCTION 1/

COUNTRY	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
							<u>KG/PERSON/YEAR</u>						
BANGLADESH	-	-	-	-	-	138	159	147	162	145	156	151	140
INDIA	-	72	74	74	75	75	67	74	65	78	66	81	82
INDONESIA	-	-	-	114	116	108	117	119	116	118	115	124	124
REPUBLIC OF KOREA	130	117	101	126	119	119	115	121	124	128	141	160	139
PHILIPPINES	-	82	93	92	85	72	89	88	88	90	94	101	100
TAIWAN	-	171	153	158	145	150	136	145	145	154	143	129	127

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.

APPENDIX TABLE 7--PER CAPITA WHEAT PRODUCTION 1/

COUNTRY	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
							<u>KG/PERSON/YEAR</u>						
BANGLADESH	-	-	-	-	-	1	1	1	1	3	3	4	6
INDIA	-	31	35	37	43	46	42	36	40	46	46	49	54
INDONESIA	-	-	-	0	0	0	0	0	0	0	0	0	0
REPUBLIC OF KOREA	6	6	7	7	7	6	4	3	3	3	2	1	1
PHILIPPINES	-	0	0	0	0	0	0	0	0	0	0	0	0
TAIWAN	-	1	1	0	0	0	0	0	0	0	0	0	0

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.

APPENDIX TABLE 8--PER CAPITA BARLEY PRODUCTION 1/

COUNTRY	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
BANGLADESH	-	-	-	-	-	-	-	-	-	-	-	-	-
INDIA	-	7	5	5	5	5	4	4	5	5	4	4	3
INDONESIA	-	-	-	-	-	-	-	-	-	-	-	-	-
REPUBLIC OF KOREA	54	50	53	51	48	45	47	41	39	47	48	22	35
PHILIPPINES	-	-	-	-	-	-	-	-	-	-	-	-	-
TAIWAN	-	-	-	-	-	-	-	-	-	-	-	-	-

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.

APPENDIX TABLE 9--PER CAPITA CORN PRODUCTION 1/

COUNTRY	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
BANGLADESH	-	-	-	-	-	-	-	-	-	-	-	-	-
INDIA	-	12	11	10	13	9	11	10	9	12	10	9	9
INDONESIA	-	-	-	25	22	19	30	24	22	19	23	29	23
REPUBLIC OF KOREA	-	-	-	-	-	-	-	-	-	-	-	-	-
PHILIPPINES	-	49	55	53	52	46	56	61	65	65	63	69	67
TAIWAN	-	-	-	-	-	-	-	-	-	-	-	-	-

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.

APPENDIX TABLE 10--NET RICE SELF-SUFFICIENCY 1/

COUNTRY	: 1967	: 1968	: 1969	: 1970	: 1971	: 1972	: 1973	: 1974	: 1975	: 1976	: 1977	: 1978	: 1979
	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:
BANGLADESH	-	-	-	-	-	96	99	98	100	96	99	98	96
INDIA	-	100	100	100	100	99	99	100	102	107	100	103	106
INDONESIA	-	-	-	95	96	92	92	95	94	92	89	94	88
REPUBLIC OF KOREA	98	93	83	88	79	100	98	87	108	93	110	95	86
PHILIPPINES	-	101	100	99	84	90	95	95	98	100	109	105	107
TAIWAN	-	121	94	106	98	104	92	104	108	117	117	107	125

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.
NET RICE SELF-SUFFICIENCY IS EQUAL TO NET RICE PRODUCTION DIVIDED BY RICE
CONSUMPTION. NET RICE PRODUCTION EQUALS RICE PRODUCTION MINUS SEED USE MINUS
FEED USE. WASTE IS NOT SUBTRACTED FROM EITHER PRODUCTION OR CONSUMPTION.

APPENDIX TABLE 11--NET CEREAL SELF-SUFFICIENCY 1/

COUNTRY	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:
BANGLADESH	-	-	-	-	-	78	87	84	94	90	88	89	84
INDIA	-	94	96	97	99	96	95	94	97	104	97	100	103
INDONESIA	-	-	-	93	95	88	90	92	91	87	85	90	84
REPUBLIC OF KOREA	89	81	73	72	67	73	74	68	73	80	80	74	74
PHILIPPINES	-	87	89	88	76	79	86	86	89	87	91	91	91
TAIWAN	-	91	74	83	76	79	70	80	85	90	89	81	89

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT. NET CEREAL SELF-SUFFICIENCY IS EQUAL TO NET CEREAL PRODUCTION DIVIDED BY CEREAL CONSUMPTION. NET CEREAL PRODUCTION EQUALS CEREAL PRODUCTION MINUS SEED USE MINUS FEED USE. WASTE IS NOT SUBTRACTED FROM EITHER PRODUCTION OR CONSUMPTION. CEREALS INCLUDE: BANGLADESH-RICE, WHEAT; INDIA-RICE, WHEAT, BARLEY, CORN, MILLET, SORGHUM; INDONESIA-RICE, WHEAT, CORN; KOREA-RICE, WHEAT, BARLEY; PHILIPPINES-RICE, WHEAT, CORN; TAIWAN-RICE, WHEAT.

COUNTRY	: 1967	: 1968	: 1969	: 1970	: 1971	: 1972	: 1973	: 1974	: 1975	: 1976	: 1977	: 1978	: 1979
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- = NOT APPLICABLE.

51

APPENDIX TABLE 13--NET IMPORTS OF RICE, COMMERCIAL AND CONCESSIONAL

ITEM	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1,000 METRIC TONS, MILLED BASIS													
BANGLADESH: 1/													
COMMERCIAL	-	-	-	-	-	0	105	24	74	44	279	1	437
CONCESSIONAL	-	-	-	-	-	474	98	45	436	135	108	18	226
TOTAL	-	-	-	-	-	474	203	69	510	179	387	19	663
INDIA: 1/													
COMMERCIAL	496	513	386	221	299	48	21	16	166	112	19	2/ -137	-440
CONCESSIONAL	0	0	99	0	0	96	0	0	0	94	2	4	0
TOTAL	496	513	485	221	299	144	21	16	166	206	21	-133	-440
INDONESIA: 1/													
COMMERCIAL	NA	NA	263	257	35	263	1,206	928	632	1,022	1,601	1,290	1,503
CONCESSIONAL	NA	NA	341	699	468	485	458	142	44	274	363	548	427
TOTAL	NA	NA	604	956	503	748	1,664	1,070	676	1,296	1,964	1,838	1,930
REPUBLIC OF KOREA: 1/													
COMMERCIAL	142	266	85	4	275	69	220	242	177	25	4	1	393
CONCESSIONAL	0	0	630	548	707	475	178	45	269	128	56	0	0
TOTAL	142	266	715	552	982	544	299	287	446	153	60	1	393
PHILIPPINES: 1/													
COMMERCIAL	289	-15	0	-2	85	90	183	98	135	55	16	-48	-166
CONCESSIONAL	0	0	0	0	286	361	148	68	0	0	0	0	0
TOTAL	289	-15	0	-2	371	451	331	166	135	55	16	-48	-166
TAIWAN: 3/													
COMMERCIAL	-195	-82	-43	-39	-1	-69	-22	52	12	3	5	-289	-241
CONCESSIONAL	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	-195	-82	-43	-39	-1	-69	-22	52	12	3	5	-289	-241

NA = NOT AVAILABLE.

- = NOT APPLICABLE.

1/ CALENDAR YEARS.

2/ NEGATIVE NUMBERS INDICATE NET EXPORTS.

3/ JULY/JUNE YEARS ENDING IN YEAR SHOWN.

APPENDIX TABLE 14--TOTAL IMPORTS OF WHEAT AND WHEAT FLOUR, WHEAT EQUIVALENT,
COMMERCIAL AND CONCESSIONAL 1/

ITEM	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79
	<u>1,000 METRIC TONS</u>												
BANGLADESH:													
COMMERCIAL	-	-	-	-	-	-	0	966	805	200	223	371	393
CONCESSIONAL	-	-	-	-	-	-	2,435	663	1,314	802	709	856	772
TOTAL	-	-	-	-	-	-	2,435	1,629	2,119	1,002	932	1,227	1,165
INDIA:													
COMMERCIAL	676	757	399	258	129	96	975	1,681	5,074	5,012	2,611	115	0
CONCESSIONAL	5,695	5,743	3,172	2,896	2,384	1,617	393	1,986	1,325	1,432	1,031	734	635
TOTAL	6,371	6,500	3,571	3,154	2,513	1,713	1,368	3,667	6,399	6,444	3,642	849	635
INDONESIA:													
COMMERCIAL	73	241	102	49	32	53	129	508	748	776	717	773	973
CONCESSIONAL	21	161	485	773	748	531	850	244	180	81	435	344	307
TOTAL	94	402	587	822	780	584	979	752	928	857	1,152	1,117	1,278
REPUBLIC OF KOREA:													
COMMERCIAL	404	379	277	269	773	725	1,052	1,521	1,716	1,493	1,540	1,305	1,475
CONCESSIONAL	374	627	1,219	830	907	1,422	503	154	21	67	479	465	221
TOTAL	778	1,006	1,496	1,099	1,680	2,147	1,555	1,675	1,737	1,560	2,019	1,770	1,696
PHILIPPINES:													
COMMERCIAL	545	649	601	599	591	649	637	452	481	695	767	760	685
CONCESSIONAL	13	12	16	9	39	28	61	60	19	15	26	43	82
TOTAL	558	661	617	608	630	677	698	512	500	710	793	803	767
TAIWAN:													
COMMERCIAL	321	488	481	518	727	496	635	870	442	584	547	647	680
CONCESSIONAL	65	48	3	28	14	45	0	0	0	0	0	0	0
TOTAL	386	536	484	546	741	541	635	870	442	584	547	647	680

- = NOT APPLICABLE.

1/ INCLUDES GRAIN EQUIVALENT OF BULGAR; JULY/JUNE YEARS.

Source: International Wheat Council.

APPENDIX TABLE 15---PERCENTAGE OF RICE AND WHEAT IMPORTS THAT WERE CONCESSIONAL 1/

ITEM	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
	<u>PERCENT</u>												
BANGLADESH:													
RICE	-	-	-	-	-	100	48	65	85	75	28	95	34
WHEAT	-	-	-	-	-	-	100	41	62	80	76	70	66
INDIA:													
RICE	0	0	20	0	0	67	0	0	0	46	11	--	--
WHEAT	89	88	89	92	95	94	29	54	21	22	28	86	100
INDONESIA:													
RICE	NA	NA	56	73	93	65	28	13	7	21	18	30	22
WHEAT	NA	NA	83	94	96	91	87	32	19	9	38	31	24
REPUBLIC OF KOREA:													
RICE	0	0	88	99	72	87	45	16	60	84	93	0	0
WHEAT	48	62	81	76	54	66	32	9	1	4	24	26	13
PHILIPPINES:													
RICE	0	--	0	--	77	80	45	41	0	0	0	--	--
WHEAT	2	2	3	2	6	4	9	12	4	2	3	5	11
TAIWAN:													
RICE	--	--	--	--	--	--	--	0	0	0	0	--	--
WHEAT	17	9	1	5	2	8	0	0	0	0	0	0	0

-- = NET EXPORTER.

NA = NOT AVAILABLE.

- = NOT APPLICABLE.

1/ BY VOLUME; RICE DATA FOR CALENDAR YEARS; WHEAT DATA FOR JULY/JUNE YEARS ENDING IN YEAR SHOWN. ALL TRADE IS NET. NO WHEAT WAS EXPORTED BY THESE COUNTRIES, EXCEPT FOR ABOUT 500,000 TONS PER YEAR BY INDIA IN 1972/73, 1977/78, AND 1978/79.

APPENDIX TABLE 16--TOTAL RICE IMPORTS DIVIDED BY RICE CONSUMPTION 1/

COUNTRY	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
							PERCENT						
BANGLADESH	-	-	-	-	-	4	1	2	3	2	2	0	6
INDIA	-	1	1	1	1	0	0	0	0	1	0	0	0
INDONESIA	-	-	-	7	4	5	11	7	4	8	11	10	10
REPUBLIC OF KOREA	4	6	17	17	20	11	11	5	11	4	1	0	4
PHILIPPINES	-	0	0	1	16	10	9	6	2	1	0	0	0
TAIWAN	-	0	0	0	0	0	6	1	0	0	0	0	0

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.

APPENDIX TABLE 17--TOTAL WHEAT IMPORTS DIVIDED BY WHEAT CONSUMPTION 1/

COUNTRY	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
							PERCENT						
BANGLADESH	-	-	-	-	-	98	95	106	106	68	89	71	96
INDIA	-	23	16	14	8	2	13	20	27	20	1	0	0
INDONESIA	-	-	-	101	106	105	112	96	101	105	96	110	96
REPUBLIC OF KOREA	81	86	88	91	93	94	99	96	96	95	103	98	96
PHILIPPINES	-	99	103	99	106	97	93	101	103	115	101	93	104
TAIWAN	-	100	109	150	101	111	102	95	90	101	101	97	105

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.

APPENDIX TABLE 18--TOTAL CORN IMPORTS DIVIDED BY CORN CONSUMPTION 1/

COUNTRY	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
	<u>PERCENT</u>												
BANGLADESH	-	-	-	-	-	-	-	-	-	-	-	-	-
INDIA	-	1	0	1	0	0	0	0	0	0	1	0	0
INDONESIA	-	-	-	0	0	0	5	0	0	4	1	1	3
REPUBLIC OF KOREA	-	-	-	-	-	-	-	-	-	-	-	-	-
PHILIPPINES	-	2	1	2	12	9	6	9	3	9	8	3	6
TAIWAN	-	-	-	-	-	-	-	-	-	-	-	-	-

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.

APPENDIX TABLE 19--CEREAL IMPORTS DIVIDED BY CEREAL CONSUMPTION 1/

COUNTRY	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
	<u>PERCENT</u>												
BANGLADESH	-	-	-	-	-	22	13	18	11	6	14	8	19
INDIA	-	7	5	4	2	1	5	6	9	6	0	0	0
INDONESIA	-	-	-	11	7	10	13	11	8	13	15	14	14
REPUBLIC OF KOREA	13	19	28	30	33	35	36	27	33	21	24	24	21
PHILIPPINES	-	14	11	12	25	21	16	14	11	15	14	11	14
TAIWAN	-	23	21	27	20	24	28	23	20	23	24	24	30

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.
FOR INCLUDED CEREALS, SEE APPENDIX TABLE 11.

APPENDIX TABLE 20--GOVERNMENT PROCUREMENT, STOCKS, AND DISTRIBUTION OF RICE

ITEM	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
	1,000 METRIC TONS, MILLED BASIS												
BANGLADESH:													
PROCUREMENT 1/							5	72	129	348	311	569	361
BEGINNING STOCKS 2/							0	0	0	36	454	138	350
DISTRIBUTION 1/							429	125	183	517	785	607	562
INDIA: 3/													
PROCUREMENT	2,785	3,373	3,581	3,043	3,462	2,550	3,462	3,482	5,042	5,999	4,656	5,546	5,871
BEGINNING STOCKS	417	665	1,182	1,724	1,834	2,310	1,357	1,409	1,094	2,804	5,629	5,709	7,983
DISTRIBUTION	3,010	3,287	3,405	3,050	3,230	3,586	3,206	3,753	3,211	3,643	4,589	3,239	3,600
INDONESIA:													
PROCUREMENT 4/	NA	NA	244	531	562	138	268	536	539	410	404	881	431
BEGINNING STOCKS 5/	NA	NA	366	236	397	387	198	418	783	536	579	459	709
DISTRIBUTION 4/	NA	NA	1,127	1,108	1,062	1,527	1,224	1,251	1,410	1,840	2,792	1,863	2,835
REPUBLIC OF KOREA:													
PROCUREMENT 6/	351	279	133	320	351	492	507	480	735	790	1,043	1,043	1,356
BEGINNING STOCKS 7/	NA	NA	NA	NA	73	4	343	449	134	631	626	1,027	777
DISTRIBUTION 6/	NA	NA	NA	NA	1,180	589	606	972	553	848	606	1,183	1,683
PHILIPPINES:													
PROCUREMENT 1/	NA	NA	NA	NA	NA	NA	NA	NA	63	150	208	450	327
BEGINNING STOCKS 2/	NA	NA	NA	NA	NA	NA	68	60	180	215	219	236	536
DISTRIBUTION 1/	NA	NA	NA	NA	NA	NA	NA	NA	235	200	230	182	137
TAIWAN: 3/													
PROCUREMENT	725	744	538	543	477	332	257	500	490	743	666	NA	NA
BEGINNING STOCK	294	299	372	480	476	420	371	260	360	539	877	959	NA
DISTRIBUTION	395	443	287	179	359	271	232	344	253	317	289	NA	NA

NA = NOT AVAILABLE.

- = NOT APPLICABLE.

1/ JULY/JUNE YEARS ENDING IN YEAR SHOWN.

2/ AS OF JULY 1 OF PREVIOUS CALENDAR YEAR.

3/ CALENDAR YEARS.

4/ APRIL/MARCH YEARS BEGINNING IN YEAR SHOWN.

5/ AS OF APRIL 1 OF YEAR SHOWN.

6/ NOVEMBER/OCTOBER YEARS ENDING IN YEAR SHOWN.

7/ AS OF NOVEMBER 1 OF PREVIOUS CALENDAR YEAR.

APPENDIX TABLE 21--GOVERNMENT PROCUREMENT, STOCKS, AND DISTRIBUTION OF WHEAT

ITEM	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1,000 METRIC TONS													
BANGLADESH: 1/													
PROCUREMENT	-	-	-	-	-	-	0	0	0	7	0	12	0
BEGINNING STOCKS	-	-	-	-	-	-	0	0	0	182	337	235	247
DISTRIBUTION	-	-	-	-	-	-	2,231	1,630	1,602	1,178	688	1,422	1,245
INDIA: 2/													
PROCUREMENT	779	2,373	2,417	3,183	5,088	5,024	4,531	1,885	4,098	6,618	5,171	5,470	8,000
BEGINNING STOCKS	1,276	760	2,126	2,329	3,127	5,031	1,900	1,018	1,221	4,769	12,253	11,532	9,039
DISTRIBUTION 3/	7,366	5,755	5,195	5,105	5,347	6,608	7,130	5,669	7,545	5,015	6,229	6,855	6,247

- = NOT APPLICABLE.

1/ ALL DATA FOR JULY/JUNE YEARS ENDING IN YEAR SHOWN.

2/ CALENDAR YEARS.

3/ 805,000 METRIC TONS EXPORTED TO BANGLADESH IN 1972 NOT INCLUDED.

APPENDIX TABLE 22--PER CAPITA GOVERNMENT STOCKS OF RICE 1/

COUNTRY	: 1970	: 1971	: 1972	: 1973	: 1974	: 1975	: 1976	: 1977	: 1978	: 1979
	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:
BANGLADESH	-	-	0	0	0	0	6	2	4	1
	:	:	:	:	:	:	:	:	:	:
INDIA	3	3	4	2	2	2	5	9	9	12
	:	:	:	:	:	:	:	:	:	:
INDONESIA	2	3	3	2	3	6	4	4	3	5
	:	:	:	:	:	:	:	:	:	:
REPUBLIC OF KOREA	2	0	10	13	4	18	17	28	21	10
	:	:	:	:	:	:	:	:	:	:
PHILIPPINES	NA	NA	2	1	4	5	5	5	12	15
	:	:	:	:	:	:	:	:	:	:
TAIWAN	33	32	28	24	17	23	33	53	56	NA

NA = NOT AVAILABLE.
- = NOT APPLICABLE.

1/ CALCULATED FROM MID-YEAR POPULATIONS AND STOCKS AS OF:

JULY 1 - BANGLADESH, PHILIPPINES.
JANUARY 1 - INDIA, TAIWAN.
APRIL 1 - INDONESIA.
NOVEMBER 1 - KOREA.

APPENDIX TABLE 23--PER CAPITA PUBLIC DISTRIBUTION OF CEREALS

ITEM	PERIOD	YEAR					AVERAGE
		1	2	3	4	5	
		<u>KG/PERSON/YEAR</u>					
BANGLADESH:	1975/76-1979/80						
RICE		6.55	9.68	7.29	6.59	8.03	7.63
WHEAT		14.92	8.48	17.19	14.60	19.88	15.01
TOTAL						22.64	
INDIA:	1975-79						
RICE		5.27	5.86	7.24	5.01	5.46	5.77
WHEAT		12.39	8.07	9.83	10.60	9.47	10.07
TOTAL							15.84
INDONESIA:	1974/75-1978/79						
(RICE)							
TOTAL		9.77	10.74	13.68	20.28	13.21	13.54
OPEN MARKET ONLY		2.67	4.26	7.28	14.57	7.32	7.22
REPUBLIC OF KOREA: 1/	1975/76-1979/80						
(RICE)							
OPEN MARKET		23.32	16.39	31.46	43.98	44.07	31.84
PHILIPPINES:	1975/76-1979/80						
(RICE)							
TOTAL		4.67	5.24	4.05	2.97	2.26	3.84
TAIWAN:	1973-77						
(RICE)							
TOTAL		15.03	21.87	15.77	19.38	17.33	17.88
OPEN MARKET ONLY		2.72	5.40	.31	2.63	.48	2.31

1/ SOME BARLEY ALSO DISTRIBUTED.

APPENDIX TABLE 24--MILLED RICE CONSUMPTION, GROSS 1/

COUNTRY	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
							<u>1,000 METRIC TONS</u>						
BANGLADESH	-	-	-	-	-	9943	11447	10979	12155	11726	12503	12602	12151
INDIA	-	36272	38215	39093	40653	42182	38196	42654	37454	44141	40460	49351	49194
INDONESIA	-	-	-	13600	13993	14073	15621	15839	15842	16988	17660	18447	19993
REPUBLIC OF KOREA	3944	3817	3789	4600	4961	3976	4006	4826	4083	4959	4714	6275	6103
PHILIPPINES	-	2772	3317	3408	3823	3083	3735	3755	3739	3857	3765	4351	4351
TAIWAN	-	1907	2258	2139	2165	2160	2261	2166	2116	2137	2018	2033	1749

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.
 GROSS: WASTE/LOSSES HAVE NOT BEEN SUBTRACTED.

APPENDIX TABLE 25--MILLED WHEAT CONSUMPTION, GROSS 1/

COUNTRY	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
							<u>1,000 METRIC TONS</u>						
BANGLADESH	-	-	-	-	-	2382	1586	1831	948	873	1838	1532	2074
INDIA	-	17906	19092	19470	21619	25775	24351	23451	23968	24248	27389	29536	31052
INDONESIA	-	-	-	558	397	673	484	698	609	788	838	833	1021
REPUBLIC OF KOREA	648	803	1017	1462	1502	1578	1434	1356	1314	1220	1548	1452	1280
PHILIPPINES	-	432	398	418	474	460	412	364	391	493	548	562	577
TAIWAN	-	418	387	334	392	433	507	483	426	461	452	480	515

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.
 GROSS: WASTE/LOSSES HAVE NOT BEEN SUBTRACTED.

APPENDIX TABLE 26--MILLED BARLEY CONSUMPTION, GROSS 1/

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.
GROSS: WASTE/LOSSES HAVE NOT BEEN SUBTRACTED.

APPENDIX TABLE 27--MILLED CORN CONSUMPTION, GROSS 1/

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.
GROSS: WASTE/LOSSES HAVE NOT BEEN SUBTRACTED.

COUNTRY	: 1967	: 1968	: 1969	: 1970	: 1971	: 1972	: 1973	: 1974	: 1975	: 1976	: 1977	: 1978	: 1979
---------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

- = NOT APPLICABLE.

53

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.
GROSS: WASTE/LOSSES HAVE NOT BEEN SUBTRACTED.

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.
GROSS: WASTE/LOSSES HAVE NOT BEEN SUBTRACTED.

APPENDIX TABLE 31--PER CAPITA MILLED BARLEY CONSUMPTION, GROSS 1/

COUNTRY	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:
BANGLADESH	-	-	-	-	-	-	-	-	-	-	-	-	-
INDIA	-	4	3	3	3	3	3	3	3	3	2	2	2
INDONESIA	-	-	-	-	-	-	-	-	-	-	-	-	-
REPUBLIC OF KOREA	36	36	38	35	32	35	35	36	43	28	38	19	19
PHILIPPINES	-	-	-	-	-	-	-	-	-	-	-	-	-
TAIWAN	-	-	-	-	-	-	-	-	-	-	-	-	-

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.
GROSS: WASTE/LOSSES HAVE NOT BEEN SUBTRACTED.

APPENDIX TABLE 32--PER CAPITA MILLED CORN CONSUMPTION, GROSS 1/

COUNTRY	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:
BANGLADESH	-	-	-	-	-	-	-	-	-	-	-	-	-
INDIA	-	9	7	7	10	6	8	6	6	8	7	6	6
INDONESIA	-	-	-	13	12	11	19	14	14	13	15	20	15
REPUBLIC OF KOREA	-	-	-	-	-	-	-	-	-	-	-	-	-
PHILIPPINES	-	23	26	25	25	22	28	31	31	29	27	28	27
TAIWAN	-	-	-	-	-	-	-	-	-	-	-	-	-

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.
GROSS: WASTE/LOSSES HAVE NOT BEEN SUBTRACTED.

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.

GROSS: WASTE/LOSSES HAVE NOT BEEN SUBTRACTED. FOR INCLUDED CEREALS, SEE APPENDIX TABLE 11.

APPENDIX TABLE 34--PER CAPITA MILLED CEREAL CONSUMPTION, NET 1/

- = NOT APPLICABLE.

11 / CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.

1/ CALENDAR YEARS FOR INDONESIA, GROW YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TABLE 11.
NET: WASTE/LOSSES ESTIMATES NETTED OUT OF CONSUMPTION. FOR INCLUDED CEREALS, SEE APPENDIX TABLE 11.

APPENDIX TABLE 35---PER CAPITA MILLED RICE CONSUMPTION, NET 1/

COUNTRY	: 1967	: 1968	: 1969	: 1970	: 1971	: 1972	: 1973	: 1974	: 1975	: 1976	: 1977	: 1978	: 1979	
	:	:	:	:	:	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	:	:	:	:	:	
BANGLADESH	:	-	-	-	-	-	125	141	132	142	133	138	136	128
INDIA	:	-	64	66	66	67	68	60	66	57	66	59	70	69
INDONESIA	:	-	-	-	111	111	109	118	116	114	119	121	123	130
REPUBLIC OF KOREA	:	125	118	115	136	144	113	112	133	110	131	122	160	153
PHILIPPINES	:	-	74	86	86	93	74	87	85	83	84	80	90	88
TAIWAN	:	-	132	152	140	139	136	139	131	125	124	115	114	96

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.
 NET: WASTE/LOSSES ESTIMATES NETTED OUT OF CONSUMPTION.

APPENDIX TABLE 36---PER CAPITA MILLED WHEAT CONSUMPTION, NET 1/

COUNTRY	: 1967	: 1968	: 1969	: 1970	: 1971	: 1972	: 1973	: 1974	: 1975	: 1976	: 1977	: 1978	: 1979	
	:	:	:	:	:	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	:	:	:	:	:	
BANGLADESH	:	-	-	-	-	-	31	20	22	11	10	21	17	22
	:	:	:	:	:	:	:	:	:	:	:	:	:	:
INDIA	:	-	31	33	33	36	41	38	36	36	36	40	42	43
	:	:	:	:	:	:	:	:	:	:	:	:	:	:
INDONESIA	:	-	-	-	5	3	5	4	5	5	6	6	6	7
	:	:	:	:	:	:	:	:	:	:	:	:	:	:
REPUBLIC OF KOREA	:	21	26	32	45	45	46	41	38	36	33	41	38	33
	:	:	:	:	:	:	:	:	:	:	:	:	:	:
PHILIPPINES	:	-	12	11	11	12	11	10	9	9	11	12	12	12
	:	:	:	:	:	:	:	:	:	:	:	:	:	:
TAIWAN	:	-	30	27	22	26	28	32	30	26	27	26	27	29

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.
 NET: WASTE/LOSSES ESTIMATES NETTED OUT OF CONSUMPTION.

APPENDIX TABLE 37--PER CAPITA MILLED BARLEY CONSUMPTION, NET 1/

COUNTRY	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
BANGLADESH	-	-	-	-	-	-	-	-	-	-	-	-	-
INDIA	-	4	3	3	3	3	2	2	3	3	2	2	2
INDONESIA	-	-	-	-	-	-	-	-	-	-	-	-	-
REPUBLIC OF KOREA	35	35	37	34	31	34	34	35	41	27	37	19	18
PHILIPPINES	-	-	-	-	-	-	-	-	-	-	-	-	-
TAIWAN	-	-	-	-	-	-	-	-	-	-	-	-	-

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.
 NET: WASTE/LOSSES ESTIMATES NETTED OUT OF CONSUMPTION.

APPENDIX TABLE 38--PER CAPITA MILLED CORN CONSUMPTION, NET 1/

COUNTRY	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
BANGLADESH	-	-	-	-	-	-	-	-	-	-	-	-	-
INDIA	-	8	6	6	8	5	7	6	5	7	6	5	5
INDONESIA	-	-	-	13	12	11	19	14	14	13	15	19	15
REPUBLIC OF KOREA	-	-	-	-	-	-	-	-	-	-	-	-	-
PHILIPPINES	-	22	25	25	25	22	27	30	30	28	26	27	27
TAIWAN	-	-	-	-	-	-	-	-	-	-	-	-	-

- = NOT APPLICABLE.

1/ CALENDAR YEARS FOR INDONESIA, CROP YEARS FOR ALL OTHER COUNTRIES; SEE APPENDIX TEXT.
 NET: WASTE/LOSSES ESTIMATES NETTED OUT OF CONSUMPTION.

APPENDIX TABLE 39--SUMMARY OF RESULTS OF PER CAPITA
CONSUMPTION LINEAR TREND REGRESSIONS 1/

COUNTRY/CEREAL	:	R ²	:	\bar{R}^2	:	T-STATISTIC OF TREND COEFFICIENT
TOTAL CEREALS:	:					
BANGLADESH	:	0.15		0.01		-1.04
INDIA	:	.04		-.06		.63
INDONESIA	:	.78		.75		5.27
REPUBLIC OF KOREA	:	.16		.09		1.47
PHILIPPINES	:	.17		.09		1.44
TAIWAN	:	.73		.70		-5.21
RICE:	:					
BANGLADESH	:	.00		-.17		.09
INDIA	:	.00		-.10		.16
INDONESIA	:	.80		.77		5.59
REPUBLIC OF KOREA	:	.20		.13		1.67
PHILIPPINES	:	.05		-.04		.73
TAIWAN	:	.75		.73		-5.54
WHEAT:	:					
BANGLADESH	:	.12		-.02		-.92
INDIA	:	.65		.61		4.29
INDONESIA	:	.58		.53		3.33
REPUBLIC OF KOREA	:	.00		-.10		.17
PHILIPPINES	:	.10		.02		1.11
TAIWAN	:	.02		-.08		.42
BARLEY:	:					
REPUBLIC OF KOREA	:	.34		.28		-2.37
CORN:	:					
INDONESIA	:	.24		.15		1.60
PHILIPPINES	:	.35		.28		2.31

1/ MILLED BASIS; WASTE/LOSSES HAVE NOT BEEN SUBTRACTED. FOR
TIME PERIODS COVERED, SEE TEXT.

APPENDIX TABLE 40—CORRELATIONS BETWEEN ANNUAL PER CAPITA
CONSUMPTION OF SELECTED CEREALS 1/

COUNTRY	:	CEREALS	:	CORRELATION
BANGLADESH	:	RICE, WHEAT	:	-0.62
INDIA	:	RICE, WHEAT	:	.26
	:	RICE, COARSE GRAINS <u>2/</u>	:	.26
	:	WHEAT, COARSE GRAINS	:	-.66
INDONESIA	:	RICE, WHEAT	:	.70
	:	RICE, CORN	:	.63
REPUBLIC OF KOREA	:	RICE, WHEAT	:	.09
	:	RICE, BARLEY	:	-.85
PHILIPPINES	:	RICE, WHEAT	:	-.07
	:	RICE, CORN	:	.44
TAIWAN	:	RICE, WHEAT	:	-.14

1/ FOR TIME PERIODS COVERED, SEE TEXT.

2/ COARSE GRAINS INCLUDES CORN, BARLEY, MILLET, AND SORGHUM.

APPENDIX TABLE 41--VARIABILITY OF CEREAL PRODUCTION AND CONSUMPTION 1/

COUNTRY/CEREAL	PER CAPITA CONSUMPTION 2/				PER CAPITA PRODUCTION			
	STANDARD ERROR	MEAN	"COEFFICIENT OF VARIATION"	STANDARD ERROR OF THE REGRESSION 3/	MEAN	"COEFFICIENT OF VARIATION"	STANDARD ERROR OF THE REGRESSION 3/	MEAN
	(1)	(2)	(1)/(2)	(4)	(5)	(4)/(5)		
CEREALS:								
BANGLADESH	0.005698	0.1664	3.4	0.008942	0.1521	5.9		
INDIA	.007449	.1495	5.0	.01021	.1629	6.3		
INDONESIA	.004764	.1446	3.2	.006461	.1406	4.6		
REPUBLIC OF KOREA	.01384	.2043	6.8	.01011	.1750	5.8		
PHILIPPINES	.007147	.1266	5.6	.009876	.1480	6.7		
TAIWAN	.008528	.1636	5.2	.008075	.1466	5.5		
RICE:								
BANGLADESH	.006917	.1456	4.8	.009394	.1495	6.3		
INDIA	.004680	.07015	6.7	.005543	.07361	7.5		
INDONESIA	.003315	.1246	2.7	.003489	.1172	3.0		
REPUBLIC OF KOREA	.01567	.1341	11.7	.01127	.1261	8.9		
PHILIPPINES	.006209	.08861	7.0	.006712	.08948	7.5		
TAIWAN	.008209	.1353	6.1	.007961	.1463	5.4		
WHEAT:								
BANGLADESH	.007074	.02052	34.5	.0006657	.002600	25.6		
INDIA	.002645	.04033	6.6	.003774	.04208	9.0		
INDONESIA	.007583	.005263	14.4	-	-	-		
REPUBLIC OF KOREA	.007571	.03708	20.4	-	-	-		
PHILIPPINES	.001296	.01115	11.3	-	-	-		
TAIWAN	.002620	.02827	9.3	-	-	-		
BARLEY:								
REPUBLIC OF KOREA	.006016	.03311	18.2	.005939	.04460	13.3		
CORN:								
INDONESIA	.002520	.01474	17.1	.003724	.02337	15.9		
PHILIPPINES	.002414	.02681	9.0	.003861	.05851	6.6		

- = NOT APPLICABLE.

1/ FOR TIME PERIODS COVERED, SEE TEXT.

2/ MILLED BASIS, WASTE/LOSSES HAVE NOT BEEN SUBTRACTED.

3/ FROM LINEAR TREND REGRESSIONS.

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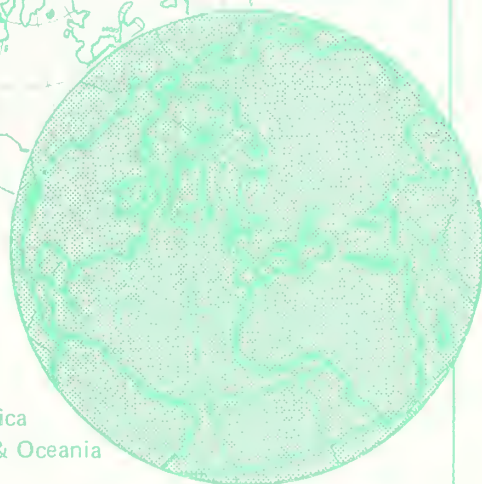
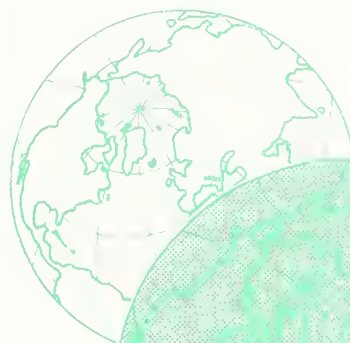
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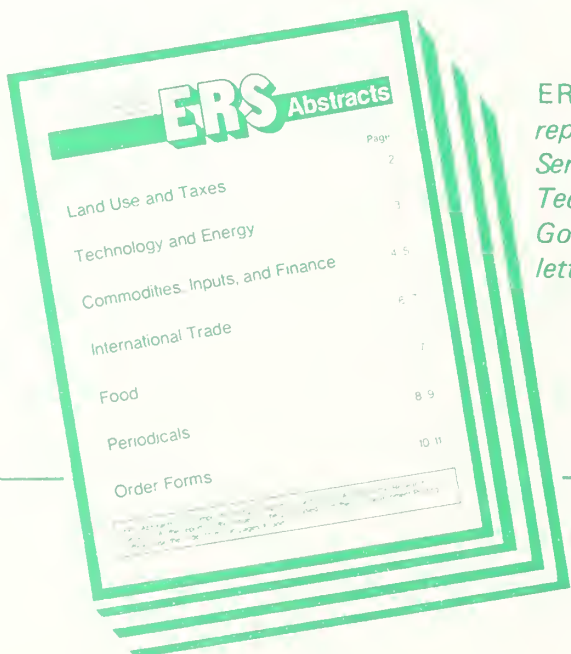
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